

**PART 6.**

**PRICE 1s.**

**RESEARCHES**

ON

**FOSSIL BONES,**

IN WHICH ARE ESTABLISHED

THE CHARACTERS OF

**VARIOUS ANIMALS**

**WHOSE SPECIES HAVE BEEN DESTROYED**

**BY THE REVOLUTIONS OF**

**The Globe;**

BY

**BARON CUVIER,**

Great Officer of the Legion of Honour, Counsellor of State, and Member of the Royal Council of Public Instruction, One of the Forty of the French Academy, Perpetual Secretary to the Academy of Sciences, Member of the Academies and Royal Societies of London, Berlin, Petersburg, Stockholm, Edinburgh, Copenhagen, Gottingen, Turin, Bavaria, Modena, The Netherlands, Calcutta, and of the Linnæan Society of London, &c. &c. &c. &c.

**FOURTH EDITION,**

**Revised and Completed**

BY ADDITIONAL NOTES,

AND A

**SUPPLEMENT LEFT BY THE AUTHOR.**

Triomphante des eaux, du trépas, et du temps,  
La terre a cru revoir ses premiers habitans.

DE LILLE.

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**IN FOUR VOLUMES.**

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**LONDON:**

**G. HENDERSON, 2, OLD BAILEY, LUDGATE-HILL.**

AND SOLD BY ALL BOOKSELLERS.

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1834

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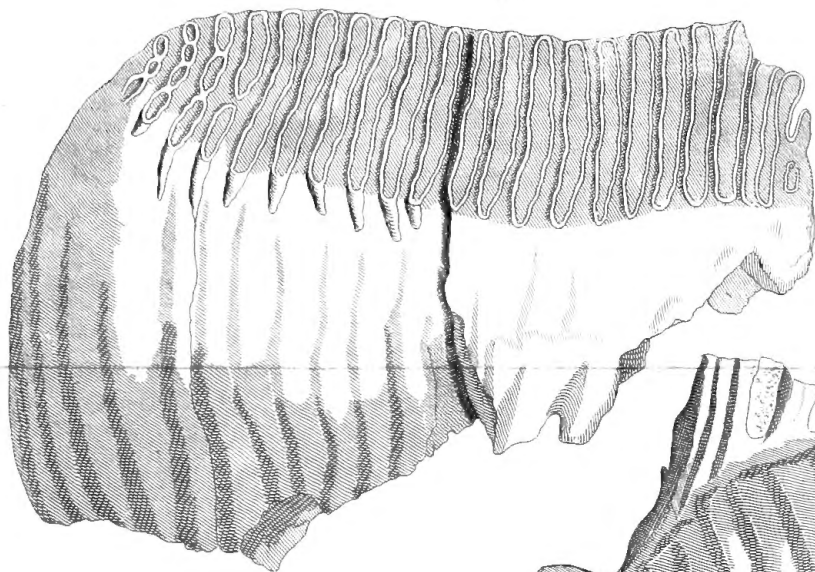
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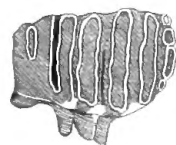
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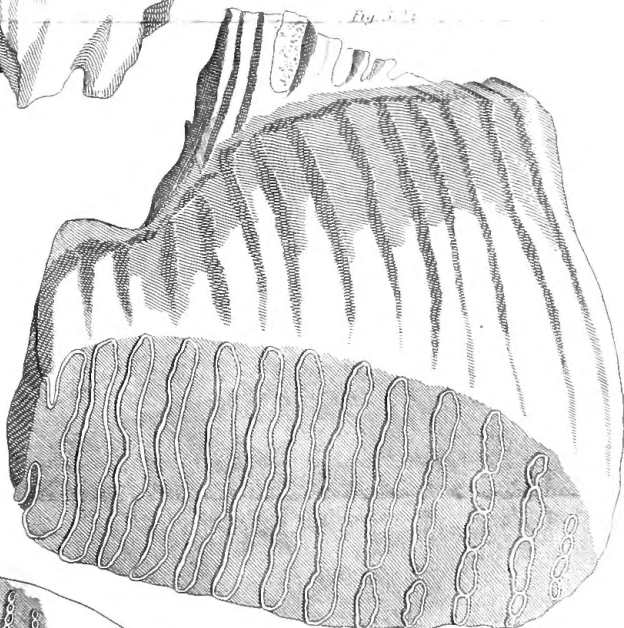
*Fig. 1.*



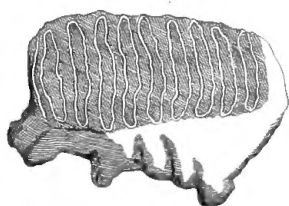
*Fig. 2.*



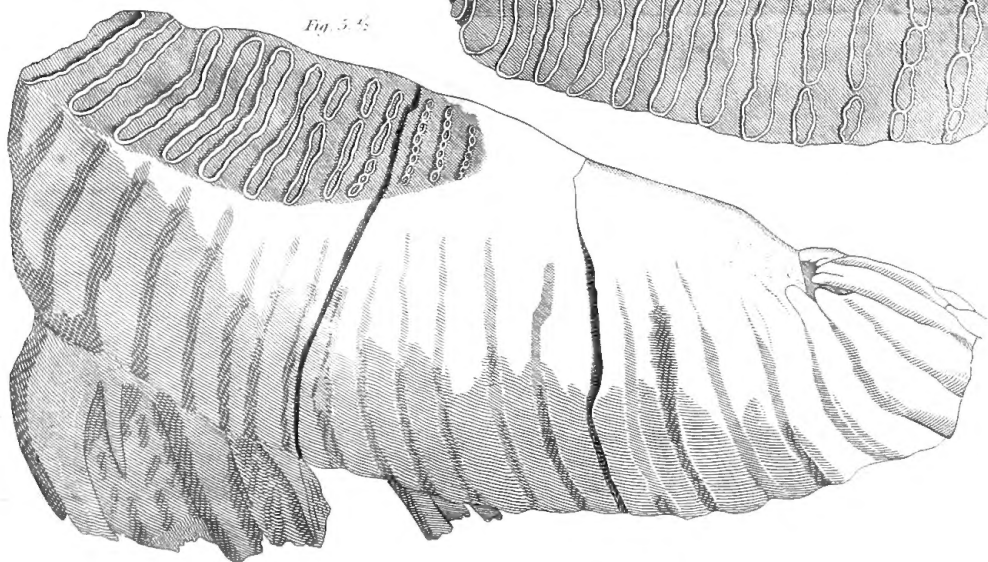
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



ELEPHANTS. PL. VI.



Fig. 1.  $\frac{1}{2}$

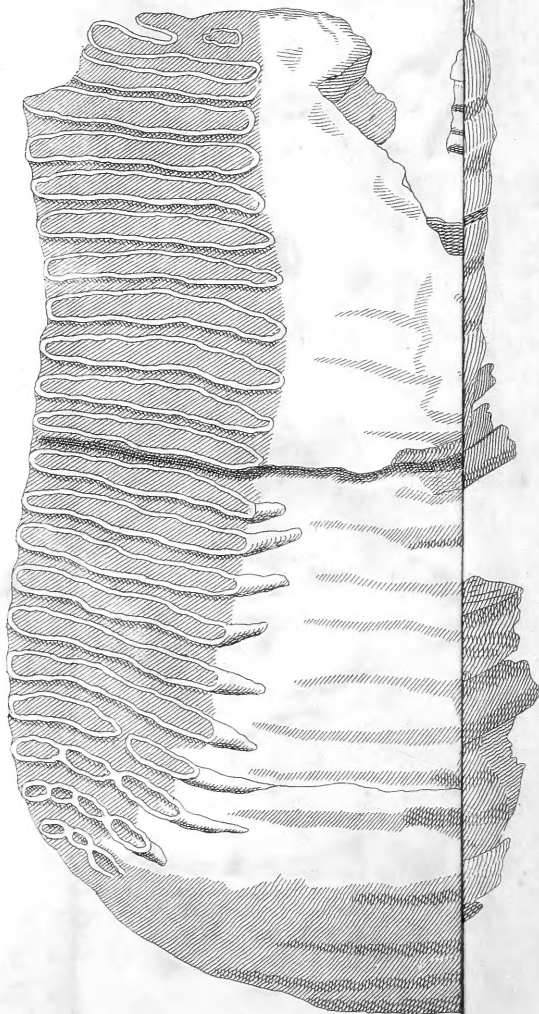


Fig. 2.

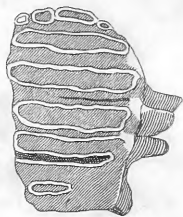


Fig. 3.  $\frac{1}{2}$



ELEPHANTS. PL. VI.



Fig. 2.

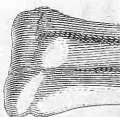


Fig. 12.

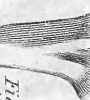


Fig. 13.

A.

1/12



Fig. 18.



Fig. 19.  
A. 1/8



Fig. 22.



Fig. 23.

1 1/8

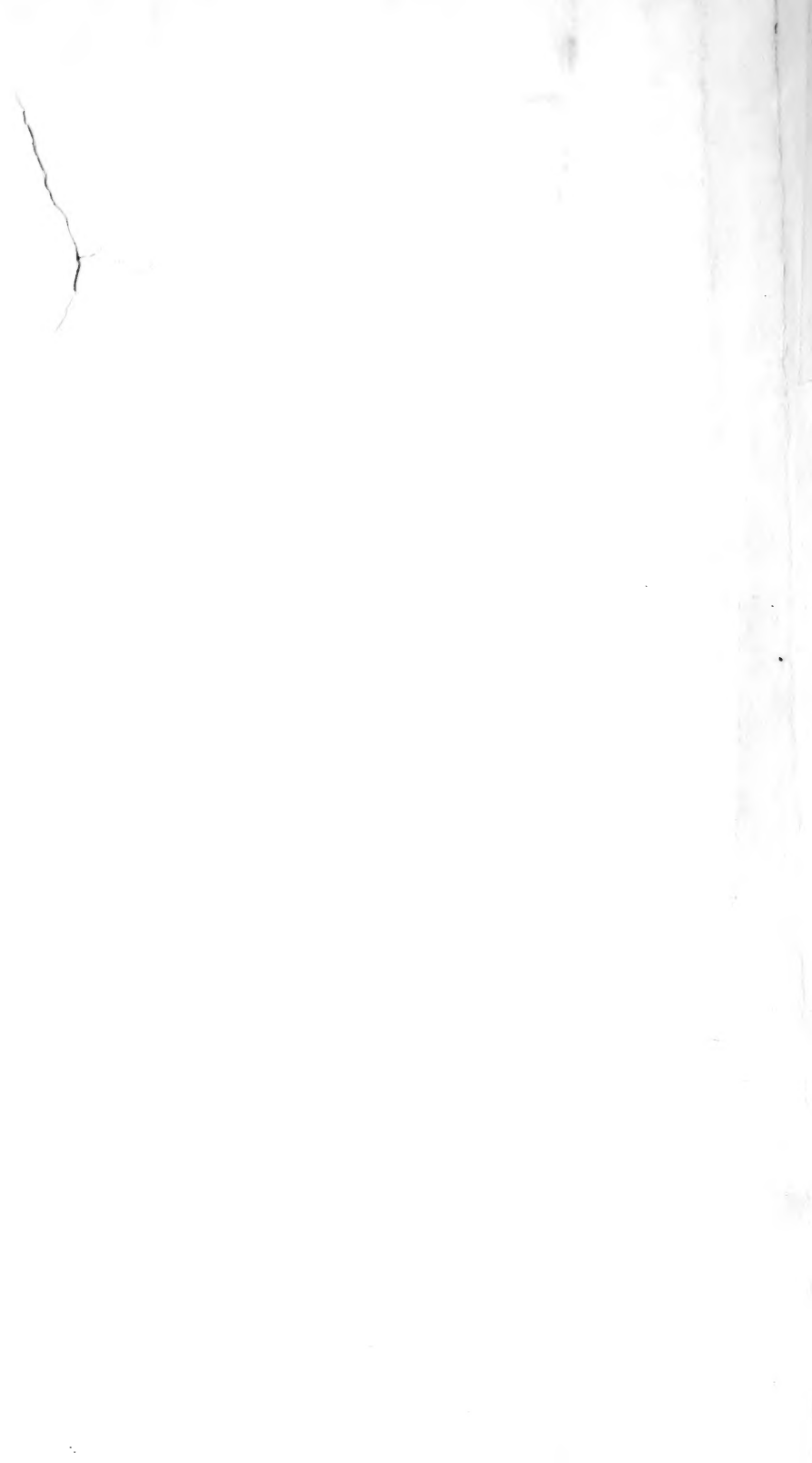


Fig. 15.

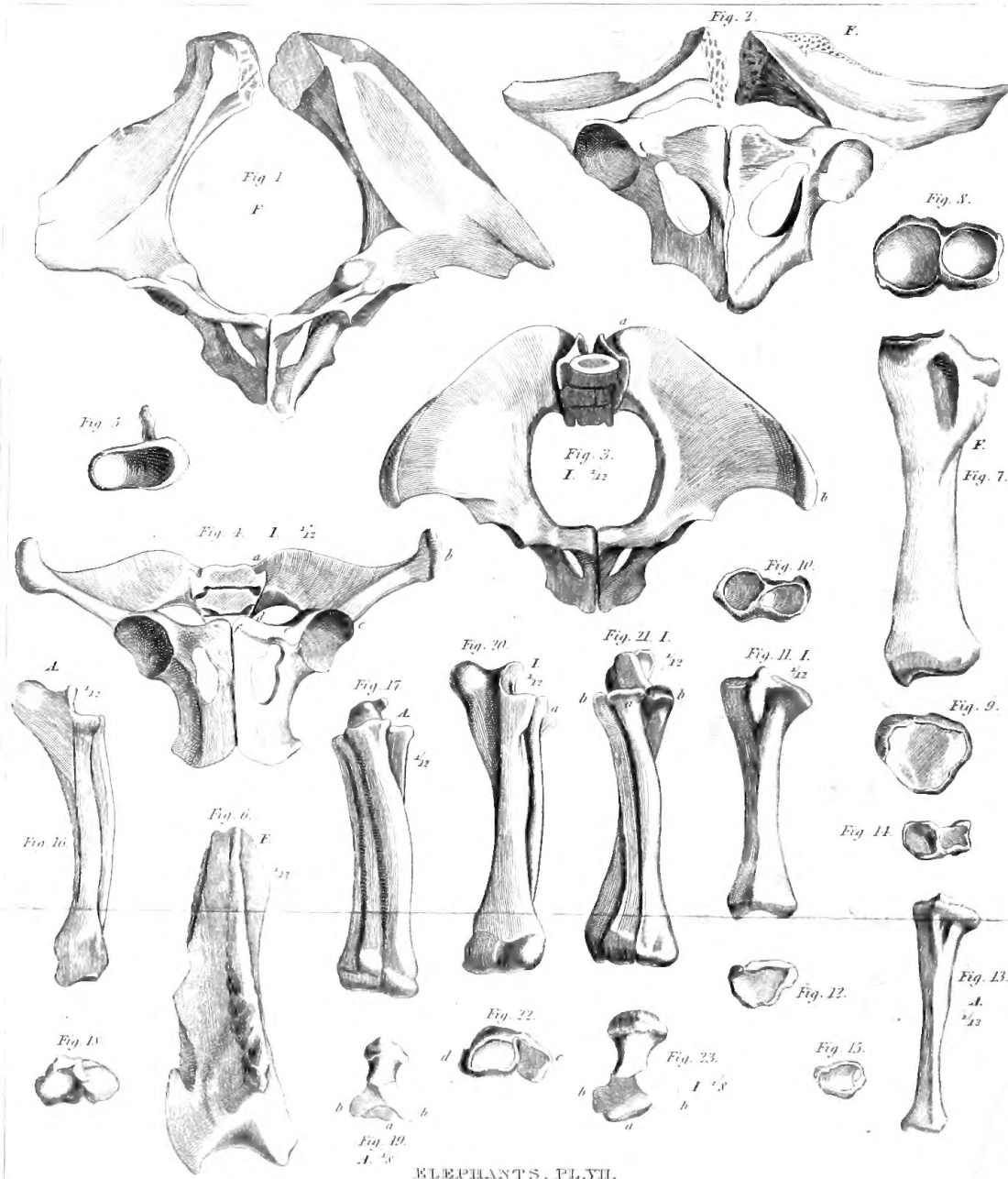


STEREOPHANTS. PL. VII.

London: Henderson, 2, Old Bailey.









*Fig. 6. A. 1/2*



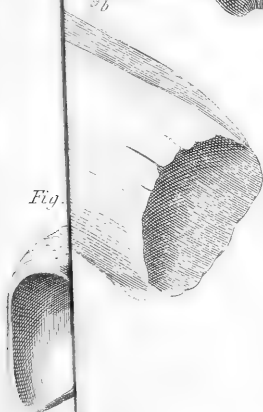
*Fig. 7. A. 1/2*



*Fig. 10. F.*



*Fig.*



*Fig. 11. E.*



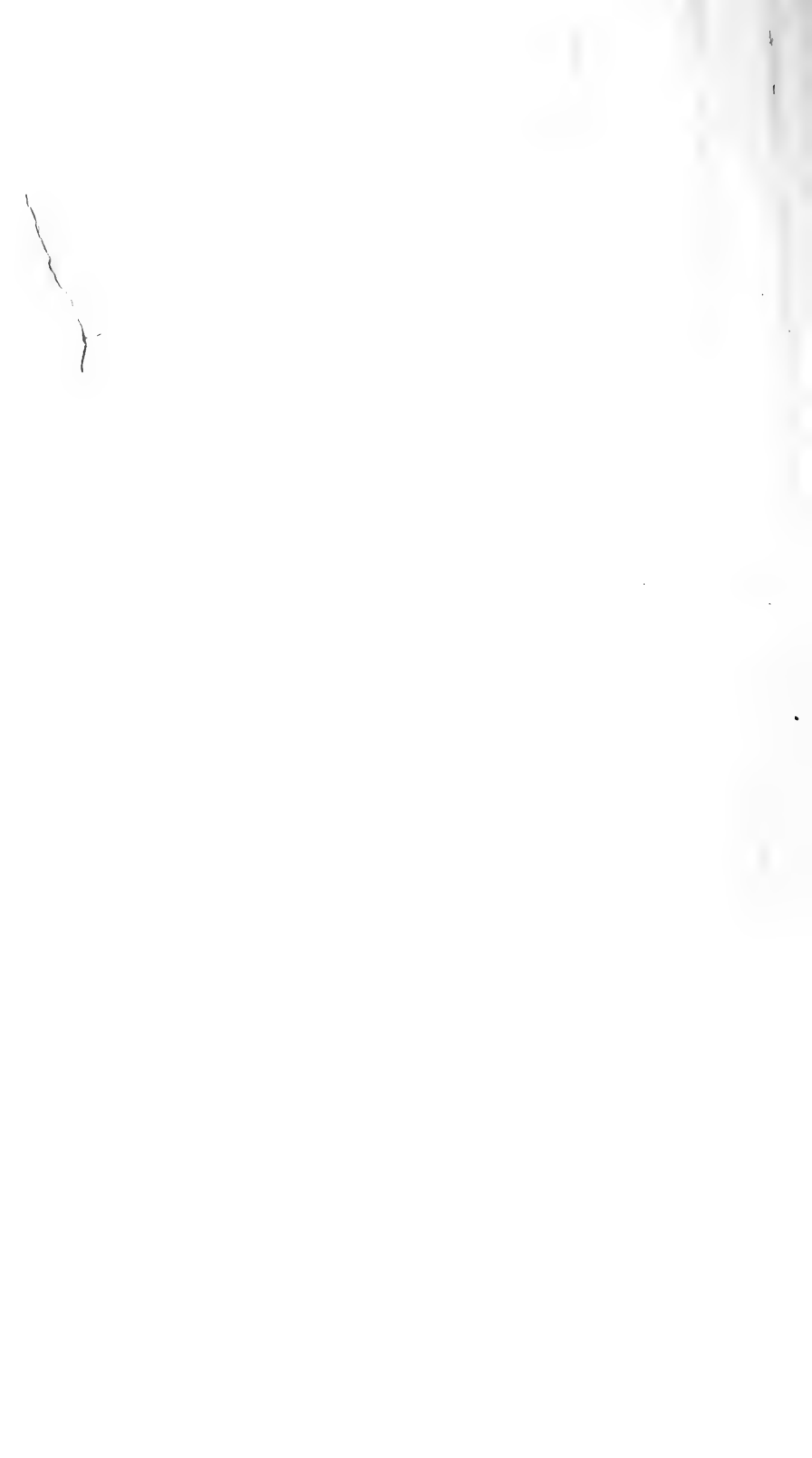


Fig 1 F

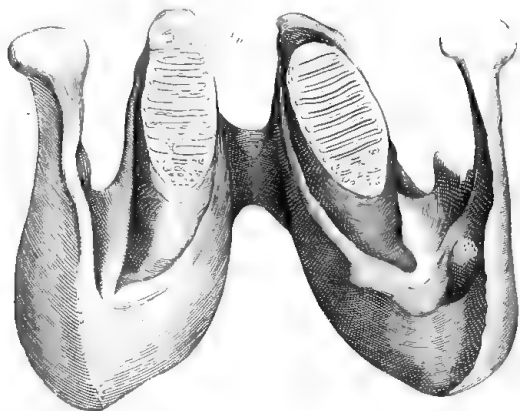


Fig 4 F



Fig 5 F



Fig 6 I 'n



Fig 7 A 'n



Fig 8 F



Fig 10 I



Fig 11 F



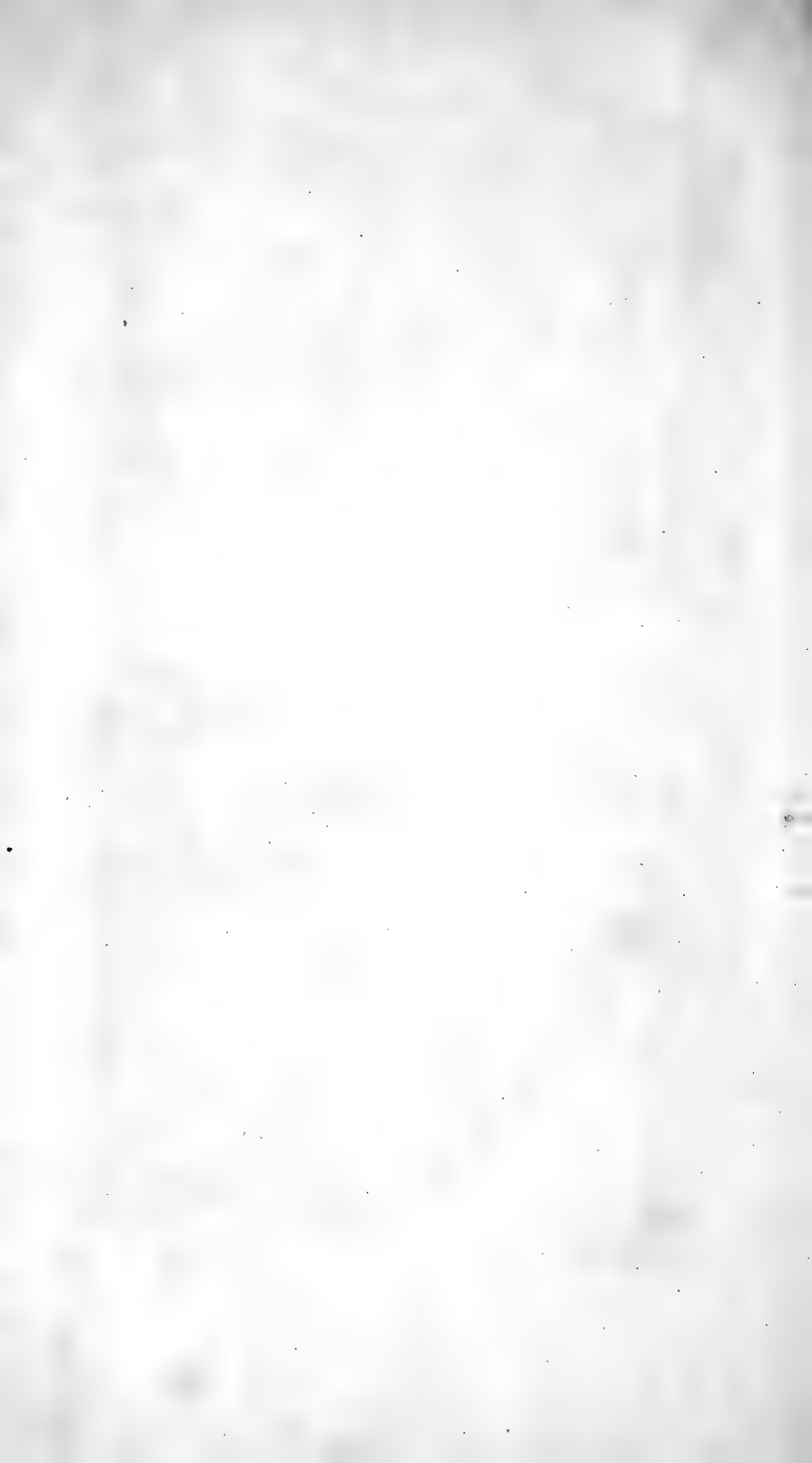
Fig 2 F 'n



Fig 9 'n



ELEPHANTS PL. VII



Authors who have cited the facts.	Their <i>Vouchers</i> and the details on the origin of the tusks.	Length following the curve.	Diameter at the thick end.	Weight.
FAUJAS. Geolog. p. 243.	The largest tusk of the Museum of Natural History of Paris.	6' 6"	5" 4'''	72 80
FORTIS. Mem. pour l'Hist. Nat. de l'Ital. II.	Tusk from the Cabinet of Florence.	...	7" 6'''	..
PENNANT.	Great tusks from Mozambique.	10' Engl. or 9' 2" Fr.	..	..
	Several tusks measured by Eden.	9' Eng.	..	90 to 125
	Lopès .. .. .	..	..	200
	Drack .. .. .	..	..	200
BUFFON. Nat. Hist. t. ix, in 4to.	Tusks of Lowango, according to the voyage of the Indian Company.	..	..	126
	Tusks from the Cape, according to Kolbe.	..	..	60 to 120

As the tusks grow during the entire of life, and the same does not take place with respect to the remainder of the body, the size of an elephant cannot be inferred from that of its tusks, even on establishing the proportion between individuals of the same variety and the same sex: as on the one side the tusks are blunted or broken at their point, according as the animal makes more or less use of them, and as they sharpen in a point more or less rapidly, one cannot with certainty infer their length from their diameter at the base.

Finally, their weight cannot be inferred from their dimensions, because the cavity of their base may be more or less filled.

The degree of curve in the tusks of elephants varies nearly as much as their size. We have seen above the most common differences in this respect amongst the elephants of India. There is in different cabinets a great number of tusks with curves more or less curious, and particularly with a spiral form. Camper saw several of them in the British Museum\*, and Grew has given a drawing of one†, which makes several turns. I know, by a letter of M. Fabbroni, that there is also one in the cabinet of Florence. They are seen very commonly in the form of the Italian S, &c.

### 3. Differences relative to the form of the Cranium.

I had the advantage of being the first to remark, in 1795, the distinctive characters presented by the skulls of two elephants, which are

\* Anat. Descript. of an Elephant, plate xv. fig. 4 & 5.

† Mus. Soc. Reg., pl. iv.





so much the more interesting, as we may make application of them to living animals to distinguish them specifically from each other, without being obliged to examine their molar teeth\*. At first I recognized them only by the comparison of a skull of each species: now I have verified them in a great number of skulls which I had an opportunity of seeing in different cabinets of Europe, and of which Paris supplied me only with eight Indian and two African.

When these skulls are separated from their lower jaws, and made to rest on their molar teeth, and on the edges of the alveoli of the tusks, the zygomatic arches are nearly horizontal in both species.

If we then consider them laterally, what is most striking is the top of the head, which is almost rounded in the *African Elephant*, and raises itself in the *Indian elephant* in a sort of double pyramid.

This top or summit corresponds to the occipital arch of man and other animals, and is thus elevated in the elephant merely to afford to the occipital surface of the cranium a sufficient extent for a cervical ligament, and occipital muscles proportioned to the weight of the enormous mass which they have to sustain †.

This difference in the form of the summits arises from the difference of inclination of the frontal line, which runs much more back in the *Elephant of Africa*, where it makes with the occipital line an angle of 115 deg. than in the *elephant of India*, where it makes only an angle of 90 deg.

Thence arise the principal differences of the profile, as :

1st. The proportion of the vertical height of the head to the distance of the extremity of the bones of the nose from the occipital condyles, which are nearly equal in the *elephant of Africa*, (being as 33 to 32), and the first of which is nearly one fourth greater in the *elephant of India* (as 24 to 19).

2nd. The proportion of the distance of the edges of the alveoli of the tusks from the summit, to a line which is perpendicular to it, and goes from the extremity of the bones of the nose to the anterior edge of the occipital foramen. The former of these lines is almost double the other in the *elephant of India* (as 26 to 14). It is a little less than one fourth longer only in the elephant of Africa (as 21 to 16).

Besides these differences in the proportions, there are some in the contours :

1st. The forehead of the *elephant of India* is hollowed into a re-entrant and concave curve; that of the *African elephant* is on the contrary a little convex.

2nd. The suborbital foramen is broader in the *Indian elephant*. In the *African* it rather resembles a canal than a mere foramen.

3rd. The temporal fossa is more circular in the *African elephant* and the apophysis which separates it from the orbit, larger than in that of the *Indian*, where this fossa has an oval contour.

Considered at their anterior surface these skulls present differences just as well marked.

\* See the Memoirs of the Institute, class of the Sc. Math. et Phys., tom. 11. The plate which I give here, pl. 8, was engraved after my design, long before the first impression of the present chapter, in the Annals of the Museum, but I gave a proof of it to M. Wiedemann, professor at Brunswick, who had it copied into his Archives of Zootomy, tom. ii. c. 1. pl. 1.

† See P. nel. Jour. de Phys., xliii, p. 47—60.

1st. The greatest length of this surface, taken from the summit to the edge of the alveolus, is to its greatest breadth, taken between the post-orbital processes of the frontal bone, as 5 to 3 in the *Indian elephant*, as 3 to 2 in the *African elephant*.

2nd. The opening of the nose is nearly in the centre of the face in the *Indian elephant*; it is farther by a fifth from the edge of the alveolus, than from the top of the head in the *African elephant*.

Seen from above, these skulls differ particularly at their zygomatic arches, being more prominent in the *African* than in the *Indian*.

Behind, one is struck with new characters:—

1st. The height of the alæ of the sphenoid bone makes, in the *Indian elephant*, more than three-fourths that of the occipital surface: whilst in the *African elephant*, it does not constitute the one half.

2nd. In the *African elephant*, the posterior extremities of the zygomatic arches is nearly on a level with the occipital condyles; in that of the *Indian* it is much lower.

3rd. The occiput is terminated superiorly in the *African elephant*, by a semi-elliptic curve, and its base is formed by two lines at a very open angle. In that of the *Indian elephant*, the sides are convex arches, and the arched summit slightly concave.

The molar teeth are placed in both species on two lines which converge before: they differ only by their lamellæ, as we have already said.

These characters, taken from the form of the cranium, are, as we see, perfectly distinct, and quite sufficient to make known the living species, even exteriorly; but before applying them to the fossile skulls, it was necessary to determine the varieties which the cranium might undergo of one individual with respect to the other in the same species.

I then compared my skulls of the *Indian elephants* together, and did the same thing with my *African skulls*.

The latter, of which I had to be sure but two, presented no appreciable difference.

With respect to the former, of which I had a larger number, and for the knowledge of which I was also assisted by beautiful drawings made in London, by M. Clift, Conservator of the Museum of the College of Surgeons, who is a skilful artist, as well as a good anatomist, I found that they presented some varieties relative to the occiput and to the alveoli of the tusks.

The occiput is more full in every direction in the one than in the other, without reference to the length of the tusks.

It is also less elevated in some, and consequently the summit of the head is more rounded, as may be seen in the cranium of *mooknah*, male and adult, presented by M. Corse to the Museum of the London Surgeons, and represented *pl. 18, fig. 3*. To judge from the cranium of the young skeleton in Mr. Brooks' cabinet, (*pl. 18, fig. 1 & 2*) the young individuals might have this part more rounded.

The alveoli of the tusks of the *dauntelah* are a little more oblique before; those of the *mooknah*, incline a little more straight downwards.

These latter alveoli are a little thinner, but not at all in the proportion of the tusks themselves. What is wanting to the thickness of the tusks is compensated by a greater thickness in the osseous substance of the alveolus. The reason is, that the alveolus, serving as a base, and place of attachment to the muscles of the trunk, could not shorten as much as the tusk, without the trunk losing the thickness and strength which are necessary to it.

Finally, there is a little variety in the length of the alveoli, and what is still very remarkable, without any relation to that of the tusks. Our large *mooknah* skeleton has them larger than our two *dauntelah*, though its tusks are the smallest of all.

The longest alveoli which I have yet seen, are those of the *mooknah* (*pl. 18, fig. 3*); but a very old *dauntelah* with very thick and blunt tusks, the skull of which, preserved in the Museum of the India Company in London, was sketched by M. Clift, and is engraved *pl. 18, fig. 4*. is, of all the skulls I have seen, that of which the alveoli are shortest in proportion.

Now, this difference in length does not reach two inches; it could not be considerable without the organization of the trunk essentially changing, because the muscles of its lower part are inserted under the lower edge of the alveoli of the tusks, and those of the upper part are inserted in the forehead above the bones of the nose. The base of the trunk has then necessarily in vertical diameter the distance between these two points; and if the alveoli were continued a certain way beyond that, the trunk would acquire a monstrous size.

This matter is very important to remark, because it furnishes the most distinctive character of the fossil elephant.

If we compare the small number of figures of elephants' skulls, found in the works of naturalists, I do not think we discover therein more marked differences than those I have stated.

Indeed, the late Mr. Faujas supposed a difference between the skulls of males and females, of which I have made no mention; but he was deceived by mere external appearances.

Our *male mooknah* of Ceylon, carried at the root of the trunk a very perceptible prominence, which was not in the female. M. Faujas, imagining that this prominence depended on the bony parts, had these two heads represented in *pl. 12*, of his *Essay on Geology*: "In order," says he, p. 238, "to avoid an error in the case, where one might find, by lucky chance, fossil heads of male and female elephants, because being aware of the fact, one would not be tempted to make two different species of them."

But dissection shewed that this projection was merely produced by two cartilages covering the entrance of the canals of the trunk into the bony nares.

These cartilages were a little more bunched out in this male than in the other individuals.

This was not even a character common to all the males: the *dauntelah* of Bengal which we then had, possessed it not.

The same author gave to his figures *tusks much larger* than these two individuals had them: "In order," says he, "to show to those who

have never seen elephants, the manner in which these animals carry their tusks." But, then, he should not have given large ones to the female, which never carries such in the Indian species.

I make these critical remarks on the work of my deceased confrère, only because it is a matter of importance that serious errors contained in a book, otherwise useful, should not be propagated.

#### 4.—*Differences relative to the external Ears.*

Most of the characters which we are after stating, contributing to the general configuration of the head, are perceptible on the outside; there is another still more external, and which may render the species distinguishable at the first glimpse. I think also I was the first to remark it; it consists in the size of the ears.

The *Indian elephant* has them of a moderate size; they are enormous, and cover the entire shoulder in the *African elephant*.

I satisfied myself on the first point: 1st, on three elephants which I saw alive, and which I afterwards dissected; two were from Ceylon, and the third from Bengal: 2nd, on two others which I saw alive, and on two which I examined when stuffed: 3rd, on all the figures well known to belong to the species of the *Indian elephant*, particularly those of Buffon, Blair, and Camper: 4th, on the figure of an embryo of an elephant of Ceylon, described by E. A. W. Zimmermann\*.

With respect to the second point, I have as my proof—

1st. *The elephant of Congo*, dissected by Duverney; its figure may be seen in the Memoirs to serve for the History of Animals, part iii, and I am quite certain that the ear is not there exaggerated, because it was still preserved for some time at the Museum, and I there saw and examined it.

2nd. An ear preserved in the cabinet of the King of Denmark, and taken from an elephant killed at the Cape of Good Hope by Captain Magnus Jacobi, in 1675. It is three feet and a half long, and two feet and a half wide †.

3rd. *A young elephant of Africa*, which was in our Museum, and is now in that of the University of Leyden; its ears, though diminished by drying, are still as large as his head.

4th. An embryo of an *elephant of Africa* belonging to our Museum ‡.

5th. All the figures well known to be *elephants of Africa*.

From these characters we may satisfy ourselves from what species the figures have been made, of which the origin is not known, or those presented to us by various monuments.

Thus the elephants, represented on the Roman medals, are almost all of Africa §.

Gessner's || drawing, copied by Aldrovande ¶, is that of the *African*

\* Erlang, 1783, in 4to.

† Oliger Jacobæus, Mus. reg. Dan., 1697, fol., p. 3.

‡ The King's menagerie now possesses a very fine female African elephant, which confirms the character derived from the size of the ear.—F. C.

§ Cuper, De Elephantis in nummis obviis, passim.

|| Quadr., p. 377.

¶ Ibid., lib. 1, p. 465.

*elephant*. That of Valentin\*, copied by Labat†, and altered by Kolbe‡, is equally so.

On the contrary, those of Jonston§, which are very good, and which have served as models for those of Hartenfels||, from which Ludolph¶ afterwards borrowed his; those of Neuhof\*\*, the tusks of which are merely a little too much turned up; those of Edwards, in which the head is too round, because it was taken from a young subject to which the tusks were to have been added, are those of the *Indian elephant*.

The two drawings of Buffon††, copied by Schreber‡‡, and by Alessandri§§, are the two sexes of the Indian species.

Meyer gives a tolerably good drawing of a male *dauntelah* (*Vorstell. allerh. thiere*, 1, pl. lxix); but the skeleton (ib. lxx) is copied from Blair without any correction.

The fœtus of the elephant, preserved at the Hotel of the West India Company, at Amsterdam, and drawn by Seba, tom. 1, pl. iii, is also of the Indian species.

##### 5.—Differences taken from other parts of the Skeleton beside the Head.

For the subjects treated in this paragraph I had but one single skeleton of the African species, and of a female, that prepared by Duverney, under Louis XIV., and described by Perrault and Daubenton; but I had three of the Indian species, prepared under my own eyes by M. Rousseau, my prosector. There are two of them male; the first of the variety, called in India *mooknah*, which never has but very short tusks; the other of that called *dauntelah*, or with long tusks, which is at present in the cabinet of the Leyden University. Our animal, which belonged to the variety *mooknah* by its teeth, belonged by its form to the variety *Komarea*, or the squat kind; the *dauntelah*, on the contrary, belonged to the variety *Merghée*, or meagre kind (*élancée*). Thus they combined in them both the principal differences which Indian elephants can present. The third is that of a female of this same variety, *Komarea*, which came from Ceylon with its male, and had lived a long time with it, both in Holland and Paris.

I also saw a fourth skeleton of a young elephant at Florence, in the cabinet of the Grand Duke, and a fifth, still younger, in London, in the cabinet of M. Brooks.

Lastly, M. Mertrud preserved some isolated bones of a female of the Indian species, of the variety *Komarea*, which died in the menagerie of Versailles in 1782, the skin of which, when stuffed, was given by our Museum to the cabinet of the University of Pavia.

\* Amphitheatr. Zoot., tab. 1, fol. 3.

† Afr. Occ., iii, p. 271.

‡ Relation du cap., trad. fr., in 12, tom. iii, p. 11.

§ Quadr., tab. vii, viii, ix.

|| Elephantograph. curios. passim.

¶ Æthiop., lib. 1, cap. 9.

\*\* Ambass. Orient., Descr. gen. de la Chine, p. 94.

†† Hist. Nat., xi. pl. 1, and Suppl., iii, pl. lix, and vi, pl. 11.

‡‡ Quad., ii, tab. 78.

§§ Ibid., 1, pl. 11.

Our male Indian skeletons have shewed me that the differences in proportion of the varieties is very inconsiderable.

The bones of the females have proved that the sexes do not produce in the skeleton well-marked characters, except a little more thinness in the long bones of the female, and some differences in the pelvis; but I saw at the same time that the species produce such, that several bones, each examined separately and with attention, may make it known without any other aid, whether they come from the African species, or that of India.

1st. The *scapula*, for example, furnishes characters as well marked as the cranium. Its three sides have different proportions, and its angles different openings: in fine, its neck is much broader, and the recurrent process of its spine is quite differently placed in the Indian elephant from what it is in that of Africa.

In the *scapula* of the Indian elephant (*pl.* 14, *fig.* 6) the apophysis is between the middle and the lower third of the length of the bone; in that of Africa (*ib.* *fig.* 7) it is below the lower fourth.

2nd. The *humerus* affords specific characters less striking than the *scapula*.

However, that of Africa is more lank than that of India. Its deltoid ridge descends lower; its inferior external ridge projects less out. (See *pl.* 7, *fig.* 4, A, that of Africa, and I, that of India).

The canal of the *biceps* is also broader in the *humerus* of the African than in that of the Indian elephant.

See *pl.* 7, *fig.* 3, where the upper heads of the three humeri are represented.

3rd. The *fore-arm*. The *figs.* 16—23 of plate 13, all in the twelfth, by giving an idea of the singular conformation of the fore-arm, such as we have described above, shew also that these bones are, as the others, thinner in the African elephant (*fig.* 16, 19) than in that of India (*fig.* 20, 23). The comparison of the *figs.* 19 and 23, which shew the upper heads seen perpendicularly, points out that that of the radius is placed more obliquely in the Indian elephant, more transversely in that of Africa.

I have not found between the pelvis of the Indian elephant and that of the African elephant differences strong enough for a drawing to make them perceptible.

4th. The *femur*. In elephants in general, this bone is very long and much flattened from before backwards. The African species has it more slender, and with its neck shorter, which renders its upper part less wide than in the Indian species. (See *pl.* 11, *fig.* 6 and 7).

5th. The *leg*. The tibia of the African is much more slender than that of the Indian. One may judge of it by the *figs.* 10, 11, and 12 of plate 13, which represent the tibia of the Indian species, compared to the *figs.* 13, 14, and 15, which are of that of the African, all in the twelfth.

In other respects, the forms of these bones and of their facettes present few differences.

6th. The *fore-foot* did not present to me, between the Indian and the African elephant, other differences than a larger size in all the bones of the thumb, and a little more thickness in the metacarpal bone of the index, and in that of the little toe of the former.

7th. The *hind-foot of the elephant of Africa* is distinguished from that of *India*: 1st, in this, that the tibial surface of its astragalus is more oblique; 2nd, the peroneal surface of its os calcis is broader; 3rd, its first cuneiform bone is smaller, resting much less on the metatarsal bone of the second toe; 4th, the only bone, which represents the big toe, smaller and more pointed; 5th, the metatarsal bone of the second toe much thinner in proportion. (See *pl. 8, fig. 6*, the foot of the Indian; and, *fig. 7*, that of the African.) These differences accord, as those of the fore foot, with those which we shall presently remark in the number of the nails.

#### 6.—*Differences taken from the Nails.*

We know that there has been for a long time some uncertainty among naturalists, regarding the number of the nails of the elephant, and that some have thought that it is subject to vary.

It may so happen that a nail falls off by accident; it has even happened sometimes that excrescences on the sole of the foot have been taken for nails: but, nevertheless, there must be a natural number, which circumstances alone can alter.

I think I have found that this number is not the same in the elephant of Asia and in that of Africa; and if my conjecture is correct, this will be a third external character to be added to those already furnished by the form of the head and the size of the ears.

What my conjecture is founded on, is this:

All the elephants of India, carefully examined, are found to have five nails before and four behind.

This is the case with the elephant modelled at Naples, and represented by Buffon, tom. xi.; with the elephant which died at the menagerie of Versailles, and was dissected by Mertrud; with that which died at Cassel, and of which Zimmerman speaks; of the fœtus in the cabinet at Brunswick, described by this latter; of that represented by Seba; lastly, of the young elephant described by Camper.

The three Indian elephants of our menagerie had also this number.

M. Corse says that it is regarded in India as one of the marks of a perfect elephant.

In truth, Blair says of his own, "*Each shod with four hoofs*;" but he also gives in his drawing five toes to the left fore-foot, and four to those of the hind.

I have had but two African elephants to examine on this point—a young one stuffed, and a fœtus, of which the first is at present in the Leyden cabinet, and the other has remained with us. Their feet, particularly those of the latter, were not altered, and presented distinctly, those before four nails, and those behind three.

Perrault, the only naturalist who has given a good description of an adult African elephant, gives but three nails to all the feet; but it might be very possible that the monstrous excrescences which his animal had on all the soles, had masked a nail on the fore feet\*.

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\* The elephant of Asia, and that of Africa, at present in the menagerie, present, the first, five nails on the fore feet, and on those behind, and the second, four nails on the fore feet, and three on the hind.—F. C.



7.—*Varieties relative to the Size.*

Several naturalists having written that the fossil bones were in general of a monstrous size, and much beyond that of the living species corresponding to them, it was necessary to examine what size elephants of the present day attain in the countries which they inhabit. Unfortunately the number of testimonies to be consulted is not considerable; for, on such a matter, we cannot refer to the vague assertions of so many travellers; we want precise dimensions, taken immediately from the animal, and referred to known measures.

We have satisfied ourselves, by the animals which lived in the menagerie, and which we dissected, that the elephant may attain nearly eight feet in height at the withers, without yet having the epiphyses united to the bodies of the bones, and, consequently, without being entirely adult: our male *kómarea*, of which the epiphyses are still distinct, was not entirely eight feet; but his female, which lived some years longer, and whose height was eight feet two inches, presents no separation of those parts.

It does not appear that the domestic elephants attain at present much above this size.

According to M. Corse, who had for a long time the care of the elephants of the India company, the height of the females is generally from seven to eight feet (English), that of the males from eight to ten. The largest of which this attentive observer heard mention made, was, from the top of the head down, twelve feet two inches; from the shoulders ten feet six inches, and from the forehead to the origin of the tail fifteen feet eleven inches (always English measure): this is not nine feet and a half at the withers. Out of one hundred and fifty elephants employed by the India Company against Tippoo, there was not one ten English feet, that is, nine feet two inches.

I observe that this height of about from nine to ten feet was remarked on the elephant seen at Constantinople in the sixteenth century by Gillius\*, and in an elephant seen in 1629 at Nuremberg; another, observed in this latter city by Sturm, was but nine; that of Naples, described by Serao, and of which Buffon has given a drawing, was nine feet two inches. Three elephants which I saw alive, besides those which I dissected, were all smaller than the latter. It would appear, then, that we might regard the ordinary size of the elephants in the state of slavery, as being from nine to ten feet.

However, it cannot be denied that certain individuals of them have gone far beyond these dimensions; and, without attaching credit to the twenty-seven feet given to that of Cosroes, without even wishing to support my assertion on the nineteen feet attributed by G. J. Sauer to his own, I may quote the elephant preserved in the Cabinet of the Academy of Petersburg, which is sixteen feet and a half in height†. This elephant came from India, and was given to Peter the Great by the king of Persia.

From all that the ancients have said of the relative smallness of the

\* *Elephanti Nova Descriptio*. Hamb. 1614.

† *Essai sur la Bibl. et le Cab. de l'Ac. de Petersbourg*, par Bacmeister. Petersb. 1776. 8vo. p. 189.

elephants of Africa, we should not now expect to find them so large in this part of the world. There are some, however, which do not yield in size to the Indian elephants; and, without referring to Pigafetta, who speaks of elephants eighteen feet high, Bosman\* gives to the elephants of Guinea from ten to thirteen feet in height, and says that he saw tusks the pair of which weighed two hundred and fifty pounds (livres); and M. Lichtenstein † relates that a Dutch planter of his acquaintance had killed an elephant fourteen feet high, whose tusks weighed one hundred and fifty pounds, and positively assured me, as did also several of his countrymen, that they have been sometimes seen eighteen feet high, which must be understood, no doubt, of the feet of the Rhine.

Thus we can only explain what the ancients have said on this matter, by supposing that the elephants which the kings of Egypt, or the Carthaginians, had in their armies did not attain the size which these animals reach in the savage state, in the countries of Africa, where they find abundant nourishment.

8.—*Of the Countries inhabited by each of the two Species of living Elephants.*

To conclude this history, and this comparative description of living elephants, it would be necessary to determine with precision the limits of the countries assigned them by nature.

The species which we have called *Indian* inhabits, in fact, all India on this side the Ganges, it being from that country, or from Ceylon, that we obtained the numerous individuals whose skulls have been observed by us: there is no reason to doubt but it is the same also which is found in more remote India, and which peoples the forests of Siam, of the empire of the Birmans, and those of China.

The species called by us *the African* is found in Senegal, whence came the skeleton made for Louis XIV., and which we still possess; and at the Cape of Good Hope, from whence the isolated skull which formed the second subject of our description. There is, then, every reason to believe that the intermediate countries along the western coast of Africa contain no others.

But is that generally true of all this part of the world? The elephants of the eastern coast, along the Indian sea, are they of the same species? Those elephants which the kings of Egypt had learned to tame, and which they employed in war with so much success, were they like to those which none of the negro countries have as yet been able to domesticate? And the Carthaginians, who had so many elephants, which they made even to cross the sea, the Alps, and the Apennines, whence did they derive them, or from what species did they take them? These are questions which remain for critics and travellers to solve.

We know now for certain, by the inscription of Adulis (as I already remarked), that it was from Abyssinia the Ptolemies obtained their elephants, and it is of these same elephants of the Ptolemies that it was said they were smaller, weaker, and more timid than those of

\* Voyage de Guinée, p. 244.

† Voyage de l'Afr. Merid. i, p. 349.

India. We also saw that, according to Cosmas, an illustrious traveller and merchant, it was the same elephants of Ethiopia that the Ethiopians of his time no longer knew how to equip, which had the largest tusks, and which supplied most ivory to commerce. These two indications seem to show that the elephants of the eastern coast are the same as those of the opposite coast.

Ludolph, however, in his History of Abyssinia, states expressly that the females there have no tusks: "*Solis maribus competunt; feminae, ut cervæ, illis carent\**"; and this assertion seems to indicate the Indian species; but it will be found perhaps that a man who spoke only on the faith of an ignorant Abyssinian monk, all whose figures are borrowed from other authors, and who goes so far even as to give to Abyssinia an animal evidently of America, (the ouistiti,) merits little faith.

However, his testimony is confirmed by Bruce, at least for one particular case; for, in the account of a hunt with elephants, at which he was present†, he says that the tusks of a female were very small, whilst the male had them very large.

With respect to the Carthaginians, we do not see, by any positive passage, whence their elephants of war came; but what Appian mentions (Bell. Pun., p. m. 5) of the charge they gave to Asdrubal to take some, the thirteenth year of the second Punic war, 205 years B. C., when they learned that Scipio intended to make a descent in Africa; and the rapidity with which it appears that Asdrubal executed his commission, prove clearly that they had not to go far to look for them, and particularly that they did not go so far as Ethiopia.

Indeed, Barbary appears no longer to produce elephants at the present day; but it had them at the time of the ancients. Pliny places some in Libya‡, beyond the Syrtes, and in Mauritania; Ælian, in the forests and pasturages of Atlas§. The Carthaginians, then, must have had facilities for procuring elephants, not possessed at this day by the people of Barbary.

At present, it is only towards Senegal that we begin to meet any.

## SECTION II.

### ON THE FOSSIL BONES OF THE ELEPHANT, OR MAMMOTH OF THE RUSSIANS.

#### ARTICLE I.

Geographical Exposé of the principal Places where Fossil Bones of the Elephant have been discovered.

To attempt to specify in detail all the places where fossil bones of the elephant have been discovered, would be an endless task: it will be

\* Hist. Eth. lib. i. c. x.

† Plin. lib. viii. cap. xi.

‡ Travels to the Sources of the Nile.

§ Ælian., lib. vii. cap. ii.

sufficient to show that they have been met with at every period and in every country.

We find traces of them from the remotest antiquity. Theophrastus mentioned them in a work, which has not come down to our times; but Pliny has preserved his testimony. "Theophrastus relates that fossil ivory of a white and black colour was found, that bones protruded from the earth, and that stones impregnated with bones were discovered."—Lib. xxxvi. cap. xviii.

As certain bones of the elephant bear a much stronger resemblance to those of man, than the bones of more ordinary animals, even the most enlightened anatomists have not unfrequently mistaken them for human bones, and this has most probably given rise to all those pretended discoveries of the tombs of giants, so frequently mentioned by the writers of antiquity and the middle ages. We need only except the largest of all, which are sometimes represented as being eight or ten degrees larger than those of the largest elephants, and which we might feel inclined to refer to the cetacea, if we could depend on the accuracy of the measurements transmitted to us.

Even when more rational ideas had dispelled those chimeras, they must still cling to the opinion, that the elephants whose bones had been discovered had been brought to the place by men. As long as these discoveries were limited to Italy and the countries much frequented by the Macedonians, the Carthaginians, and the Romans, they fancied they found a sufficient explanation for them in the prodigious number of elephants possessed by those people.

Certain it is, that the first Europeans who became possessed of elephants (Alexander and the Macedonians after the defeat of Porus) \*, brought home with them a sufficient number to enable Aristotle to give an excellent account of them. That great naturalist was better acquainted than Buffon with the manner in which the elephant copulates and suckles, as well as with almost all the other details of its habits, and every particular he relates has been confirmed by observations recently made in India.

After the death of Alexander, Antigonus was in possession of the greatest number of elephants †.

The Seleucidæ always maintained a number of elephants, especially after the period when Seleucus Nicator received fifty of them from Sandrocottus in exchange for an entire canton on the banks of the Indus ‡. Seleucus was the better qualified to appreciate the importance of those animals, from his having been commander-in-chief of those of Alexander.

Plutarch assures us that this prince and his allies had four hundred at the battle of Issus, which they gained against Antigonus, 301 years before Christ §.

Antiochus Soter his son, employed twelve with great success against the Galatæ, and we may observe that Antiochus the Great ranged two hundred in a line at the battle of Raphiæ, against Ptolemy Philopator, who had only sixty-three ||, in the 535th year of the Roman era, and

\* Pausanias, Attic, lib. i, edit. Hanov. p. 21.

† Idem, *ibid.*

‡ Strabo, lib. xv, p. 124.

§ Plut. in Demetr.

|| Polybius, lib. v, cap. lxxix.

fifty-four at the battle of Magnesia \* against the Romans, who had but sixteen, without profiting much in the main by this great superiority in the number of his elephants, since he was vanquished in both engagements.

Phyrrus I. brought elephants into Italy in the year of Rome 472, and as he had disembarked at Tarentum, the Romans gave these strange animals the name of Lucanian oxen. They were few in number and had been taken by Phyrrus from Demetrius. Curius Dentalus took four of them from Phyrrus and brought them to Rome for the ceremony of his triumph in 479. They were the first that had been seen there, but they very soon became a common object.

Metellus having overcome the Carthaginians in Sicily in the year 502, had their elephants brought to Rome upon rafts, to the number of a hundred and four, according to Orosius; a hundred and twenty, according to Seneca; a hundred and thirty, according to Eutropius; a hundred and forty-two, according to Pliny; which, according to the account of Varro, cited by Pliny, were all slaughtered in the Circus, as the Romans did not know what to do with them.

Hannibal brought thirty-seven with him into Italy in 534 †, which with one exception were all destroyed at the battle of Trebbia ‡. His brother Hasdrubal, brought a fresh supply; and when the latter was defeated on the Metauro in 558, the drivers of the elephants were obliged to kill several of them with their own hands.

Scipio Nasica and Publius Lentulus, exhibited elephants in the Circus during their edileship in 584 §. Claudius Pulcher exhibited an elephant fight in 655. Twenty years after this, the two brothers, Lucius and Marcus Lentulus, during their edileship exhibited them fighting with bulls. According to Pliny, Pompey exhibited twenty; eighteen according to Dion Cassius, on the occasion of his second consulship in 700; and Cæsar, forty on the occasion of his third consulship in 708. Pompey yoked some to his chariot when he triumphed for the conquest of Africa. Germanicus exhibited some that danced grotesquely. It was at the games celebrated by Nero, in honour of his mother, that elephants were first exhibited dancing on ropes, and performing a number of extraordinary feats of skill. Elian tells us expressly with regard to those of Germanicus, that the elephants trained in that way were born at Rome, whence it appears they bred there "at the time that Germanicus, the grandson of Tiberius Cæsar, gave a public show of gladiators; there were at Rome several large elephants of both sexes from which many others were produced. While the latter were yet young, and while their joints were coalescing and acquiring consistency and their tender limbs assuming firmness and solidity, a man who had attained to great skill in the management of their tempers trained them to the performance of a very marvellous species of exercise."—Elian. de Anim. lib. ii, cap. xi.

Columella speaks still more positively to this fact of the propagation of elephants at Rome. "India has been long celebrated for pro-

\* Livy, lib. xxxviii. cap. xxxix.

† Polybius, lib. iii, cap. xiv.

‡ Eutropius, lib. iii, chap. viii.

§ Livy, lib. liv, cap. xix.

ducing beasts of enormous size, and yet who will deny that beasts of equally enormous bulk, have not been born in Italy, when we behold elephants that have been born within our walls?"—Columella de Re Rustica, lib. iii, cap. viii.

Had our naturalists paid sufficient attention to these two passages, they would not have been believers so long in the impossibility of causing the elephant to breed in the domestic state; and they might, perhaps, have long since attempted the experiments which have proved so successful with M. Corse.

Many of the succeeding emperors, Domitian, Antoninus Pius, Commodus, Septimus Severus Caracalla, Heliogabalus likewise, kept elephants. Gordian had thirty-two; Gallienus, ten. It would appear that the latter were the last that were exhibited in the public games.

Unquestionably then there did exist in Italy and in the other countries conquered by the Romans, a considerable number of elephants at certain well authenticated periods. Thus, although Italy presents us with an immense quantity of the bones of these animals in the fossil state, their origin has long been attributed to those individual animals which existed on the soil at periods mentioned in history: it may be too that some of them have been derived from that source, but the circumstances in which they are usually discovered prove, that a very small proportion only can belong to this class. They are almost invariably discovered intermixed with the bones of the hippopotamus and the rhinoceros, which most certainly were not brought there either by Hannibal or the Roman armies.

The following is a reference to the principal places in Italy, where to my own knowledge, bones of this description have been exhumed, but I am very far from considering it as complete.

The largest tusk was discovered near Rome in 1769, by the Duke de la Rochefoucauld and M. Desmarests; it was ten feet long, and eight inches in diameter, although it was not entire\*. We have four pieces of it in the Museum, they are much decomposed, and when put together are five feet in length.

There were some bones discovered at Rome as early as 1664, when a foundation was being dug in-front of the Vatican†. We find Baccius speaking in 1582, of similar discoveries in that city, and there is a strong probability that the body of Pallas, son of Evander, found in the reign of Henry III. in 1041 or 1054, and which was higher than the walls of the city, was nothing more than a remnant of this description.

Fortis mentions another tusk found by chance at the summit of a vineyard, and some others discovered near the Tiber, in the neighbourhood of Rome and Todi.

M. Charles Louis Morozzo gives the drawing of a jaw, found in April, 1800, in a vineyard, outside the Porto del Popolo, with many other bones and fragments of ivory.

In the cabinet of the College of La Sapienza are preserved the frag-

\* Buffon, Epochs of Nature.

† Mounsy's Travels in Italy, p. 446.

ments of skeletons found at the Villa Borghese, which is close to the Porto del Popolo.

Baglivi speaks of a skeleton eighteen palms long, exhumed in 1698, from the chalk close to the gate of Ostium.

In the museum of the Roman College are presented some teeth and fragments of tusks; one of the latter is almost a foot in diameter. There is a lower jaw there of which I took a drawing. It was found at Monteverdio near Rome, and is remarkable for having its teeth narrower and its rows larger than others of the same description. I procured half a jaw from the same place, bearing similar characteristics, which is at present in the King's Museum. Mr. Brochi likewise found a fragment of a skeleton there \*.

The museum of the Roman College is also in possession of a thigh remarkable for its length, of which I also made a drawing. Gualtieri preserves a fragment of ivory found in the neighbourhood of Rome.

Whatever route we pursue, on leaving that capital if it has been examined by attentive observers, has been found to yield these bones in great abundance.

Mr. Brocchi mentions fragments of tusks found at Torre di Quinto, near Rome, and at San-Vittorino, near Tivoli †.

Bonanni speaks of a quantity of large bones, teeth, and lower jaws exhumed in his time, near Castel-Guido on the Aurelian way, twelve miles from Rome ‡. This is the ancient Bebiana, half way between Rome and Cère.

Jer-Ambi, Langenmantel speaks of a thigh, a shoulder blade, and five vertebræ found at Vitorchiano, north-east of Viterbo, on the borders of the valley of the Tiber, and on the right bank of that river§. There is extant a dissertation on them by Chiampini ||, which fixes their species by a comparison with the drawings of the skeletons in the museum at Florence.

The Abbe Ranzani has informed me, that in the museum of the Institute of Bologna, there is an elephant's tooth which was found at Mugnano, in the territory of Viterbo, and quite close to Vitorchiano. It is enveloped in a *preperino*, a well known volcanic stone.

Targioni Tozzetti mentions a thigh found in the bed of the river Paglia, near Orvieto¶.

M. Louis Canali, professor at Perugia \*\*, relates, that within a circuit of a few miles from that city he discovered four dépôts of those bones: one in a place called Passo del Acqua, five miles to the north, and not far from the Tiber another, which, in addition, contained fragments of rhinoceros, in a bed of marine sand, nine miles from that river near Monte del Abate: another at Columbella, five miles to the

\* Brocchi.

† Conchil. Subapenn. i, p. 183.

‡ Mus. Kirck, p. 200.

§ Ephem. nat. cur. dec.

|| Chiampini on the elephant bones found at Viterbo in 1668.

¶ Travels in Tuscany, 2nd. edit., vol. viii, p. 392, 393.

\*\* See Two Letters containing Observations on some Fossil Elephant Tusks, by Professors Paolo Spadoni and Luigi Canali, Macerata, 1810.



east on the other side of the Tiber, where he had found a tusk, a thigh, and fragments of the tibia, and another at Monte Petriolo, seven miles to the east of Perugia. They, moreover, brought him a tusk found at San-Faustino, a mile outside the city, where these bones are found in the courses of torrents, an astragalus, and a portion of a tusk found at Pozzuolo, a village lying between Monte Pulciano and the lake of Trasimene, where there was also the fragment of the jaw of an hippopotamus. I have seen all those relics in his cabinet. He told me, moreover, of a piece of agatised tusk being in the possession of M. Charles de Sorbello, who had found it close to the lake.

Towards the left bank of the Tiber, Mr. Cranali discovered rows of elephants' teeth at a village to the north of Todi, and to the south of Perugia. Passeri had previously mentioned a skull, a lower jaw, and a thigh, five feet long, which had been found in the neighbourhood of Todi\*.

The papal states between the Apennines and the Adriatic have likewise yielded the bones of elephants. Passeri, in his history of the fossils of the district of Pessaro †, speaks of a skeleton laid bare by the current of a rivulet in 1759. At Orciano, near Fossombrone, on the Metauro. In the preceding century, another had been found in the same place, and had long remained hanging on the wall of the church. A third, discovered at La Schieggia, near Gubbio, on the Flaminian way, and at the sources of the Finenceino, is still preserved in the library of Gubbio ‡.

Mr. Paul Spadonio, professor at Macerate, has given a description of a skeleton, found in January, 1808, in an argillaceous clay, at Belvidere, in the marches of Ancona, not far from Jesi, which is also on the Fumesino §.

There are some writers who have not failed to attribute these fossils to the defeat of Asdrubal on the Metauro, in the year 207 before Christ. Livy, indeed, expressly states, that there were many elephants killed at that battle by their own drivers ||. Yet we must observe upon this, as upon every similar occasion, that a fact so general as that of the existence of the fossil bones of elephants will not admit of any particular explanations.

Leaving the papal states and following the courses of the Tiber, the Clanis or Chiana, and the Arno, we meet with the bones of elephants in greater abundance as we proceed. The valley of the Chisna, the valley of the Arno, and the several vallies in that direction, contain them in astonishing quantities.

A short time since Mr. Fabbroni sent me two rows belonging to an upper jaw, found in that part of the valley of Chiona, which the labours of Mr. Fossombroni have transformed from a muddy and pestilential marsh into a beautiful and fertile country.

\* Passari on the History of the Fossils of Pisaro and its Vicinity. Bologna, 1775, pp. 56, 57.

† Ibid. p. 58.

‡ Ibid. p. 63.

§ See the Letters of MM. Spadoni and Canali, quoted in a former note.

|| Livy, Book xxvii, chap. 49.

Coltellini mentions four different places in the territory of Cortona, where bones and tusks have been found \*; perhaps these are the same mentioned by Targioni Tozzetti in his travels in Tuscany †. The latter was himself in possession of a large piece of ivory found at Lucignano, not far from Cortona ‡.

M. Georges Santi, professor in the University of Pisa, has in his possession a fragment of an elephant's jaw, found near Colli Lungo, in a valley which stretches from the foot of Monte Pulciano to the great valley of Chiana. It was imbedded in that consolidated sand which in Italy is called *Tufo*, and which contains marine bodies and foreign woods in a petrified state.

It was in the valley of Chiana and district of Arezzo, that the Grand Duke Ferdinand II, that generous protector of the sciences, caused an entire skeleton to be exhumed in 1663 §; part of which, according to Targioni, is still preserved at Florence, and which most probably is that alluded to by Steno ¶ and Boccone ¶. But it is more especially in the upper valley of the Arno that they abound in such prodigious numbers. Cesalpin had already drawn attention to a thigh found at Castel San Giovanni, between Arezzo and Florence \*\*.

Dr. Barthelemy Mesnig, the descendant of a family of Lorraine, transplanted into Tuscany in the time of Francis the First, has published a little treatise in French ††, on the bones of the valley of the Arno, in which he gives drawings of several fragments, and particularly of a large portion of a head, exhumed by the late Fabrini, to which we shall hereafter advert.

The authors of our times who have gone most extensively into details on the nature of these bones are John Targioni Tozzetti †‡, and Professor Nesti §§. The former found them in great quantities in the valleys of *Riesco* and *Faella*, near the villages of *Viesca* *Faella* and *Municoro*, on the right of the Arno, and he gives us a catalogue of those he preserved in his library. He had with his own hands extracted a thigh bone penetrated with spath from the sand near *Viesca*.

He had seen many others exhumed by Dominic Sforazzini, near *Terra Nuova*, a village situated a little higher than those we have just mentioned, but on the same bank, and lying between *San Giovanni* and *Monte Varchi*. He likewise collected some on the route to *Arezzo*, and in the territory belonging to that city near the village of *Monziona* on the river *Castro*, to the left of the *Arno*.

The place to which I would particularly draw attention, as furnishing the most complete idea of the excessive abundance of these bones, is the

\* Journal of Etruria, July, 1761; and Buffon's Supplement to his Natural History, vol. v, p. 515.

† Travels in Tuscany, vol. vii, p. 413.

‡ Ibid., vol. viii, p. 401.

§ Description of the Cospian Museum, by Lorenzo Legati, p. 6.

¶ On Solids within Solids, p. 64.

¶ Natural Observations and Researches, p. 327.

\*\* Cesalpin on Metals, Book ii. p. 141.

†† Observations on the Fossil Teeth of Elephants found in Tuscany and Florence, 8vo.

‡‡ Travels in Tuscany.

§§ Memoirs of the Imperial Museum at Florence.

Museum which the Valdarnasian academy, established at Figlini, has formed in an old convent of that town. We may there behold several hundred fragments which fill two rooms, and which have all been found in the neighbourhood.

They are so common in the hills that skirt that part of the valley, that the peasants were wont to use them indiscriminately with stones in the construction of the little walls that surround their habitations. Now that they have learned to appreciate their value, they lay them aside to sell to travellers. It was in this way that I became possessed of an *atlas* of very large dimensions. It was brought to my carriage window while I was changing horses. Happening to take a walk with Professor Nesti, I myself perceived and picked up a molar tooth, which had been laid bare by a rivulet, close to that same Viesca where Targioni had found so many of those relics.

In the lower valley of the Arno they are also found in great abundance. According to the *Novelle Letterarie* of Florence, several bones and tusks were discovered in 1753, on the hills adjoining the castle of Cereto Guidi, between the lake Fucecchio and the Arno. Four of these pieces were picked up by the Chevalier Buontalenti\*.

Fortis speaks of a tusk found in the same place by Professor Nenci†. According to the account of John Targioni Tozzetti, Nenci had found the fragments of no less than four skeletons, which Targioni preserved in his museum, and which he enumerates in his collection‡. But a short time previous, a skeleton, almost quite perfect, was discovered in the same place on the estate of the Messrs. Gaddi, and many of the bones were deposited in their museum.

The bones found at Cereto Guidi form the chief subject of the letter addressed by Dr. John Targioni Tozzetti to Buffon in 1754§. In that letter the author mentions that they had belonged to animals differing very much in age, many of them having been very young, and that they were found intermixed with the bones of many other animals, such as oxen, stags, and horses. His son, Octavian Targioni Tozzetti, whose acquirements in natural science were equally extensive and profound, has presented me with the model of a very small under jaw, belonging to one of the youngest subjects, which I have placed in the King's Museum.

That entire section of the valley of Nievolo and its vicinity is very rich in the spoils of the elephant. In 1744, a tusk was exhumed near Ponte a Coppiano, quite close to the lake of Fucecchio, towards the south||. And Dr. Venturini has described some bones found on the hill of Lamporecchio, on the northern declivity of the little chain running between Pistoia and the lake¶. They are found intermixed with marine productions much more frequently in the lower than in the upper valley of the Arno. For instance, those alluded to by Tar-

\* Alcon du Lac, *Essays on Nat. Hist.*, vol. ii, p. 402.

† Fortis.

‡ *Travels in Tuscany*, book v, p. 264.

§ The letter has been translated into French, and printed in the foreign *Journal* of December, 1755. It is also to be found in the *Melanges* of Alcon du Lac.

|| Fortis' *Memoirs on the Natural History of Italy*.

¶ Idem, *Conchil. Subapenn.* vol. i, p. 184.

gioni were found in sand, intermixed with shells. According to the account of Fortis, Scali had succeeded in clearing out a tusk from a bed of stone, studded with shells, in the village of St. Giacomo near Leghorn\*.

They are likewise to be found in the mountainous country which rises towards the south on the left of the Arno. Mr. Brocchi mentions some from the neighbourhood of Sienna and Volterra; in short, they are to be found along the entire line reaching as far as the Apennines of Liguria†.

Considering this abundance, it is not astonishing that the museums of Tuscany should be filled with these spoils. The museum of the Grand Duke at Florence contained, some years since, two lower jaws, almost entire, two half jaws, a great number of tusks, and molar teeth; a demi-atlas, three vertebræ, connected together, and one separate, a shoulder, part of a thigh, two tibia, and divers other fragments; and I have been told that great additions have been made to it since I had the opportunity of seeing it.

In the museum belonging to the late Fontana, besides the head exhumed by Fabrini, described by Mesnig, and subsequently transferred to the Count Valsamachi of Cephalonia, I observed a very large thigh and two portions of jaws. In that of the University of Pisa, where Thomas Bartholin had noticed some as early as 1643‡, I counted twelve tusks or portions of tusks of different sizes; one of them was ten inches in diameter and three feet in length; in addition to these I observed six jaws, some with narrow, and others with broader rows.

There is also a collection in the museum of Dr. Branchi, professor of chemistry at Pisa. That of the abbey of Vallambrosa was celebrated for its large collection, as was also the museum of the Academy of the Fusiocritici at Sienna.

As Hannibal, after the battle of Trebbia, crossed the Apennines§.

\* Fortis, *Conchil. Subapenn.*, vol. i, 185.

† *Conchil. Subapenn.*, p. 183.

‡ *Treatise on the Unicorn*, p. 383.

§ *On the route pursued by Hannibal from Trebbia to the lake of Trasimene.*—The learned of every nation have occupied themselves with profound investigations in order to ascertain the precise spot where Hannibal crossed the immense chain of the Alps and descended into Italy. The same laborious examination has not been bestowed with a view to ascertain the point where he crossed the Apennines after the battle of Trebbia, on his road to Tuscany and to the plain where he gained the no less celebrated victory of Trasimene. Nay, I am induced to think that not one of the opinions that have been promulgated on this subject is entirely in accordance with the testimony of the ancient writers, or the presumptions suggested by the localities themselves. I shall attempt to prove this in the following observations:—

Polybius in the seventy-fourth chapter of his third book, after giving the details of the battle of Trebbia, goes on to say, "The showers of sleet fell in such abundance, that the army of Hannibal suffered severely: all the elephants of the Carthaginians perished, with the exception of a solitary individual; numbers of men and horses died of the intense cold, so that the Consul Tiberius thought himself justified in writing to the Senate, that the inclemency of the weather had snatched the victory from his hands."

Thus the battle was fought at the close of autumn.

"On the approach of spring," continues he a little further on, "the new Consul Flaminius put his legions in motion; and, having traversed Etruria, he halted at

and traversed the whole extent of the valley of the Arno, on his march against the Consul Flaminius, who was posted at Arezzo, as he halted

Arezzo, while his colleague, Servilius, marched through Umbria, to take up his position at Rimini."

The unfriendly disposition of the Gauls having induced Hannibal to quit his winter quarters at the earliest period possible, he made the most diligent inquiries concerning the roads that might conduct him into the enemy's country. He learned "that they were long, and well known to the Romans, with the exception of one leading into Etruria, across some marshes. The passage, indeed, was difficult, but short, and well calculated to strike Flaminius with astonishment on account of the singularity of the enterprise." He determined upon taking it. This resolution alarmed his followers, "who shrunk in dismay from the gulphs of the swamps and lakes that lay before them."

Polybius then proceeds to describe, in his seventy-ninth chapter, the order in which Hannibal effected this passage, and the sufferings that both he and his army had to endure during its continuance. "At length," continues he, "having in defiance of all calculations succeeded in traversing the marshes, Hannibal received information that Flaminius was posted at Arezzo. He encamped on the first dry spot that presented itself, in order to rest his troops and to reconnoitre the plans of the enemy. Observing that the country around him was rich, and, being informed of the weak character and mean capacity of Flaminius, he judged that if he passed him by, as if he were bent on some more distant enterprise, the Consul would find himself unable to resist the raileries and reproaches of his soldiers, and that, without waiting for the junction of his colleague, he would determine upon pursuing the Carthaginians into some position to which it was their object to attract him. In fact," continues Polybius in his eighty-third chapter, "as soon as Hannibal had left his camp near Fesulæ, and had passed by the Roman army, Flaminius, fancying himself despised by the Carthaginians, began to exhibit symptoms of irritation: when he beheld the desolation they were causing by ravaging and burning every thing in their path, he could no longer restrain himself; and heedless of the remonstrances of his officers, that he should wait for the junction of his colleague, he hurried forward against Hannibal. The latter had his left covered by Cortona, and his right by the lake of Thrasimene, and the more to inflame the anger of Flaminius, he carried his devastations to the extreme. At length, observing the approach of the Consul, he suddenly wheeled about to receive him."

It was there, between the lake and the hills that run almost down to it, that he gained that sanguinary victory.

It is clear then, that, after the battle of Trebbia, Hannibal entered Etruria, by traversing a very swampy country. That, on his emerging from the marshes, he encamped near Fesulæ. That he then passed by the Romans, who were stationed near Arezzo, and took up his position between Cortona and Thrasimene.

These last two portions of his route are clear beyond all doubt. From Fesulæ to Arezzo he must necessarily have passed along the upper valley of the Arno; and from the neighbourhood of Arezzo to that of Cortona, he must have followed the valley of the Chiana.

But by what road did he reach Fesulæ? Where are the marshes he traversed, and in what quarter did he cross the Apennines?

These are questions upon which people have not as yet been able to agree, and for which I think I have found a satisfactory solution.

In fact, to arrive at this result, I think it is only necessary to fill the chasms left in the narrative of Polybius by the additional matter furnished by Livy and Cornelius Nepos.

Livy has been accused of being nothing more than a copyist of Polybius; true it is that almost throughout he translates him word for word; but he must assuredly have consulted other chronicles, for he fills up the outline of the Greek historian with many important circumstances evidently true, as their connexion with the whole proves beyond all doubt.

After giving an account, in the fifty-seventh chapter of his twenty-first book, of

a moment near Fesulæ, and must then have passed beneath Arezzo, and followed the valley of Chiana on his way to his position between

the capture of Placenza, which took place in the winter subsequent to the battle of Trebbia, he speaks of a first attempt to cross the Apennines made by Hannibal, when he was deceived by a false spring; and he eloquently describes the storms that obliged him to renounce that enterprise and fall back upon Placenza. He even states expressly, that it was on this precise occasion that the Carthaginians lost seven of the elephants which had survived the battle of Trebbia, and that they had but one remaining. Near Placenza, moreover, they had a fresh encounter with the Consul Sempronius, in which they were again successful. After this Hannibal entered Liguria, while Sempronius fell back upon Lucca.

Nevertheless, in the commencement of the spring, Hannibal, whose first attempt to cross the Apennines had proved abortive, abandoned his winter-quarters, (book xxii. chap. i.) and having learned that Flaminius was already at Arezzo, although he was shown a longer but a more convenient road, he decided in favour of one traversing the marshes, rendered more than usually deep by the *inundations of the Arno*. Livy then describes the march of the Carthaginian general in terms similar to those of Polybius, and likewise conducts him to *Fesulæ*. He remarks that he was in one of the most fertile countries in Italy, the part of Etruria situated between Fesulæ and Arezzo, or, in other terms, the upper valley of the Arno: then having, like Polybius, stated the estimate formed by Hannibal of the character of Flaminius, he adds (chap. iii.), that, leaving the enemy on his left, and proceeding towards Fesulæ (*Fesulas petens*), he did his utmost to devastate Etruria. He then speaks of the irritation of Flaminius, and suddenly mentions (chap. iv.) that Hannibal ravaged the country between *Cortona* and *Thrasimene*. The remainder of the narrative of Livy is identical with that of Polybius.

It is the expression, *Fesulas petens*, that has thrown all the difficulty round the subject: it is either the mistake of Livy or of his copyists. It is very clear that Hannibal, who is represented as occupying the country between Fesulæ and Arezzo, and as anxious to entice Flaminius from Arezzo towards Cortona, could not have taken a road in an opposite direction, and at the same time return towards Fesulæ. Hence Livy, like Polybius, should have made him leave Fesulæ, and not have made him proceed towards it; perhaps, too, the original expression was *Fesulas linquens*, instead of *Fesulas petens*. In that case, his narrative would correspond with that of Polybius in this particular, as it does in every other mentioned by them both. Livy's addition would then be confined to the single circumstance, that the marshes in question were those of the Arno, marshes which are in point of fact as dangerous as any in Italy, and a great part of which are remaining to this day, not only in the delta of this river, and farther on to the north, in the direction of Liguria, but in the entire extent of the lower valley of the Arno, and more particularly near Fucecchio, and within a few leagues of Fesulæ.

It only remains for us then to fix upon the precise point where the Apennines were crossed.

Now Cornelius Nepos tells us (Hannib. ch. iv.), *per Ligures Apenninum transiit, petens Etruriam*. He crossed the Apennines in Liguria, on his way to Etruria; and he adds, that it was on this occasion that he lost his eye.

This fact, thus attested by Cornelius Nepos and Livy, must have suggested itself to every person of common sense.

For where is it natural to suppose that Hannibal, setting out from Placenza after the battle of Trebbia, and not choosing to pursue the road that was convenient, but too long, and too well known to the Romans—that is, the road by way of Modena and Bologna—where is it natural to suppose, I say, that he would cross the Apennines? The answer is simple—At the spot where he then was, near the sources of the Trebbia and the Taro, thence he must have descended towards those of the Magra—in a word, he must have followed the road of Pontremoli. It is from thence he must have descended on the marshes of the Arno, then much more extensive, and less confined by dykes than they are at present. He must have passed up the valley of the Arno until he reached the firmer ground at the foot of Fesulæ and surrounding Florence; thence passing along the upper valley of the Arno, he proceeded onwards

Cortona and Thrasimene, it was but natural that the first discoveries of the bones of elephants should have given rise to the supposition

beneath Arezzo, braving Flaminius, whom he left on his left: he then followed the valley of Chiana, and awaited or rather attracted the Consul beyond Cortona, and near to Thrasimene, at the point where the road begins to rise towards Perugia.

This entire route is so simple, it corresponds so accurately with the testimony of the historians, and the nature of the ground, that it is difficult to explain how another could have been imagined. And yet this is what has come to pass. The causes of these errors have been, 1st. The fault in the editing or copying of the passage we have cited from Livy; 2ndly. A serious mistake of Strabo; 3rdly. The ignorance of many authors with regard to the variations which have occurred at divers periods in the boundaries of Liguria and Etruria.

Cluvier (Ital. Ant. 1, 580) remarks and demonstrates very successfully that the words of Livy should be, *à Fesulis profectus*, instead of *Fesulas petens*; and he grounds this reading, as I have done, on the authority of Polybius. Hence it appears that he had got at part of the truth; but he suddenly takes it into his head to make Hannibal approach Fesulæ by way of Bologna, and accuses Cornelius Nepos of error, for making him approach it through Liguria. The other road, mentioned as being longer, more convenient, and better known, he supposes to be that of Rimini and Umbria: he does not perceive that the road by Bologna was quite as well known, and that there could not have been any marshes between Bologna and Fesulæ, for the whole route lies along the mountains. By his own fiat he creates marshes near Florence: but in coming by that route Hannibal would have found them not before but behind Fesulæ, and their passage could not have occupied much time.

The same objections hold good against Cini, Villani, and Scala, who make Hannibal march through Prato and Pistoia, and thus make him cross the Apennines above Modena; as also against Luc Holstenius, who makes him come by Forlì and descend into Tuscany by the Cazentin: and against Guazzesi, who makes him enter by the same province, and by the neighbourhood of Bagno. We must certainly admit, that selecting the road of Cazentin would allow us to retain the reading of Livy, *Læva relicto hoste, Fesulas petens* (having left the enemy on his left, marching on Fesulæ); but this is in itself an objection against this opinion, since this reading is evidently spurious for other reasons, and since, from whatever direction Hannibal had come, the word *petens* (marching on) will not be admissible: besides, he could have found no marshes in the Cazentin: the Arno does not form any there—it is too hilly a country. There is also an objection drawn from the military art against this route, as well as that of Pistoia. By proceeding in that direction, Hannibal would not only have prolonged his march, and would have been obliged to traverse an immense extent of difficult country, but he would have exposed himself to the danger of being attacked in flank or rear by Servilius, who was at Rimini, and whom nothing could have prevented from overtaking the Carthaginians in a day or two.

Unquestionably the reason why this variety of authors have not hit upon the short and natural road, corresponding so exactly with the passages of Polybius, Livy, and Nepos, which we have cited, is, that Hannibal was said to have crossed the marshes, *on his way into Etruria*. They have thence concluded that these marshes must have been outside Etruria, and that consequently they could not be the marshes of the Arno; hence they have sought them in Lombardy and on the Po.

It appears that this was the opinion adopted by Strabo, for he says that in former times there were marshes near Placentium and along the Po, which greatly embarrassed Hannibal on his road to Etruria.—Geography, book v. g. 217.

Guazzesi was so much attached to this idea, that he was anxious at all hazards to change the word *Arnus*, in Livy, into that of *Eridanus* or *Padus*, or even to suppress it altogether, although he acknowledges that all the manuscripts he had examined, or caused to be examined, agreed in giving *Arnus*.—Mem. of the Academy of Cortona, n. vi. pp. 29, 30.

But the solution of the difficulty was to be found in Polybius himself. We see by his testimony that, at the epoch of which he speaks, Etruria only began at the Arno. Polybius says expressly, that the Ligurians were in possession of the country as far as Pisa, the first city of Etruria towards the *West*, and as far as the territory



that they were the remains of those brought thither by that general : this is what Steno, the Danish philosopher, has laboured to establish in

of the Aretini. Lucca, at that period and long after, was a city of Liguria. Frontinus calls it in express terms a Ligurian city.—(bk. iii. chap. xi.) “*Domitius Calvinus besieged Lucca, a Ligurian town.*” Cæsar had Lucca under his command, as Suetonius informs us in his twenty-fourth chapter, because that command comprehended Liguria and not Etruria.

Hence, if we afterwards find in Strabo and Pliny the Magra assigned as the boundary between Etruria and Liguria, we must suppose it was the result of the new division of Italy completed by Augustus.

Cluvier has very successfully illustrated these successive boundaries. After this observation, we can understand that as long as Hannibal remained on the right bank of the Arno, above the boundary of the country of the Aretini, he was not yet within Etruria—he advanced towards it; *Etruriam petebat*. Now, according to my view of the subject, either he did not pass the Arno at all, and so passed between that river and Arezzo, or else he only passed it at the time he left Fesulæ. In either case he left that town, and Flaminius who was posted there, to his left, and proceeded towards Cortona and the lake, by the diagonal of the triangle. Why, it will be asked, did not Flaminius attempt to impede such an advance as this? For the same reason that he afterwards allowed himself to be enticed into pursuing Hannibal—because he was a bad general.

But an opinion which was without excuse, because it at once contradicted both common sense and the spurious and corrected texts, and because it led to the still greater fault of assigning the marshes to Etruria, whatever might be the boundary of that country; such an opinion owes its origin to Sanleolino and Dini, renewed by Folard, and adopted by Rollin, the latter of whom supposes that the marshes in question were those of Chinsi, that is to say, those of the Chiana.

Folard, in particular, presents us with a model of the false reasoning in which a man of talents may be entangled when his premises are unsound.

How could Hannibal have advanced behind Rimini and Arezzo, so as at once to avoid Servilius and Flaminius? Where could he have passed the Apennines so as to strike first upon Clusium? He must then have passed them in Umbria, and not in Liguria. He must even have traversed the upper valley of the Tiber, from whence it were easy for him to advance upon Rome, without having recourse to so much artifice. But this is not all. Let us admit that he might have gone as far as Clusium, why then, finding himself in the rear of Flaminius, instead of going direct towards Perugia and Rome, did he return towards Fesulæ, passing under Arezzo, and this too again to re-pass it on his way towards Perugia and the lake? How can it be said that he traversed the marshes of Clusium in order to reach Etruria, when those marshes are precisely in the centre of what was then Etruria? There is not a species of improbability or of formal contradiction to the authority of the writers on the subject, which does not meet in this hypothesis. After this, mark the reflections of that military genius upon this masterly march of Hannibal, and on the necessity of his making it!

Nevertheless, there are some objections to my system, which require explanation. The first is, How did it happen that Hannibal, having advanced from the Magra towards the Arno, did not approach the sea? and how does Polybius come to say, that it was not till after the battle of Thrasimene, and only at the port of Hadria, that he found the means of despatching a ship to Carthage?

I fancy that, being eager to come up with Flaminius, having been already retarded by his first attempt at crossing the mountains, and having as yet nothing decisive to announce to his countrymen, he hurried over the route I have specified, without wasting time on possessing himself of a port, or on despatching a ship.

The second objection is, How did it occur, supposing him to have followed this route, that he was not obliged to take the towns of Lucca and Pisa, or, at least, why the historians do not mention the manner in which he made himself master of them, or how he managed to avoid them. But whatever route he may be made to pursue, a similar objection will present itself in the shape of other towns no less considerable. The historians could not mention every thing. We can easily understand that

his treatise "On Solids contained within Solids." Nevertheless, an attentive examination of the writers who have described the march of Hannibal should have dissipated this erroneous impression, even before the circumstances in which the bones were found were sufficiently made known.

The fact is, that Hannibal did not bring more than fifty-seven elephants into Italy, (Eutropius, chap. vii.), and Polybius tells us they all died of the cold immediately after the battle of Trebbia, with the exception of a single one: Livy, who deals more in details, leaves him eight still, seven of which died soon after, in the abortive attempt at crossing the Apennines in the winter; but both authors agree in stating that in the spring, when Hannibal descended into the marshes of the lower Arno, he had no more than a single elephant, upon which the general himself was mounted, during that terrible passage in which he lost an eye. Hence it is very evident, as has already been remarked by Messrs. Targioni and Nesti, that a solitary elephant could not have furnished this innumerable quantity of bones which are scattered over all Tuscany; and now that we know that there are almost as many belonging to the rhinoceros and hippopotamus as to the elephant, and that they are all three found intermixed in the same beds, there is no longer the slightest foundation for supposing that they are the remains of animals used in war.

Dolomieu has observed these bones of elephants in their beds. He agrees with Mr. Santi in saying that they are found at the bases of hills of clay, which fill the intervals of the calcareous chains; that the beds that contain them likewise contain woods, some petrified and some bituminous, which he judged to be oak, and which are themselves covered with beds of marine shells, mixed with common plants, and by immense banks of potter's clay. As for those that came under my own observation, they were all in clay hills, rising at least fifty or sixty feet above the level of the plain.

That part of Italy which lies to the north of the Apennines is not less rich in those productions than the centre of the Peninsula.

James Blancanus has published an account of some fragments of ivory found at Monte Blancano, near Bologna.

The jaw described by Aldrovandus\*, under the vague denomination of *Dens Belluæ*, the *monster's tooth*, was most probably found in the neighbourhood of Bologna. It is still preserved in the museum of the Institute, with several other fragments which I noticed there, particularly two anterior extremities of jaw bones and several under jaws, some with very diminutive, others with larger, rows; but a part of these was brought from Hungary by Marsigli. It is the more singular that Aldrovandus did not recognize the real character of this tooth; that, in his work on the antique statues of Rome, he very properly defines a fossil jaw bone.

If there be any of those remains of fossil elephants which carries

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Sempronius, being recalled by Flaminius, had abandoned Lucca, and that Hannibal, wishing to ascend the Arno, did not think it necessary to take Pisa, which very probably was without a Roman garrison.

\* Treatise on Metals, p. 832.

with it a supposition of having been one of those which Hannibal brought into Italy, it is undoubtedly that discovered by Mr. Cortesi; for it was found at a short distance from the Trebbia, where Hannibal lost several, and close to the road which he must have pursued with the few that remained, and which perished in his first attempt at crossing the Apennines, during the winter, when he was obliged to fall back upon Placenza. It was found on Mount Pulgnasco, in the district of Diolo, nine miles below Placenza, and two from the Trebbia.

The bones were almost in the vegetable soil, for they were penetrated by roots. They were in quantity sufficient to load six mules, and amongst them were portions of the head, almost entire, with the corresponding jaws which were formed of large plates. Mr. Cortesi has had drawings made of them. He likewise mentions a tusk, nine inches in diameter, a mutilated thigh, three feet eight inches, and a shoulder bone three feet nine inches in length. All these fragments have been deposited in the Museum of the Board of Mines at Milan. The head of a rhinoceros was found hard by, as if for the purpose of falsifying the conjectures likely to arise as to the Carthaginian origin of this dépôt.

In another species of lair and at a greater depth from the surface, they found the head of a cetus, and the skeleton of a species of dolphin almost perfect\*. A remarkable dépôt, in which the bones of elephants were heaped along with those of many other animals, was found at Mount Serbaro, in the district of Romagnano, in the valley of Pantæna, three leagues from Verona. Fortis has devoted a particular memoir to their description. They were found in a trench at the summit of the hill. Among the bones of elephants was a tusk more than nine inches in diameter, and which Fortis conjectures to have been twelve feet in length. The Count de Gazola has sent to our museum from the same place, half of a lower jaw and a bone of the metacarpus, which serve to indicate an animal at least fifteen feet in height.

Piedmont has furnished them in considerable quantities; some years since I had an account from the late Mr. Giorna, of two large portions of jaws which are in the Museum of Natural History at Turin. He afterwards acquainted me that there is also an elephant's thigh in the same place. We have in our museum fragments of ivory found at Butigliano, in the province of Asti.

M. Maximilien Spinolæ, a Genoese nobleman, and author of an excellent work on the insects of Liguria, has pressed upon my acceptance the lower part of the head of a *peronea*, discovered at Annona, quite close to Asti on the road to Alexandria: it belonged to an animal at least fifteen feet in height. The name Annona being, according to some etymologists, derived from *Castrum Hannoniæ*, (the camp of Hanno) has not failed to suggest in its turn an allusion to the Carthaginians.

According to Allioni, a skeleton almost entire was found in another quarter of the district of Asti †, and Mr. Amoretti speaks of another

\* See the Memoirs of M. Joseph Cortesi on the bones of great animals found on the hills of Placenza, reprinted in his Geological Essays at Placenza, 1819.

† Brocchi on Fossil Shells of the Apennines, vol. i, p. 181.

skeleton equally perfect found at Butigliera in the same neighbourhood\*.

The bones preserved in the museums of Turin, are in general those found at Montferrat. This is a province almost entirely formed of those sandy mountains skirting the Apennines. They are almost of the same nature as those that skirt them on the side of Tuscany.

The plain of Lombardy and even the banks of the Po, are not unprovided with them. We have in the King's Museum, a lumbar vertebra, a cubitus, and an ischion, which have been contributed by the late Mr. Faujas.

The museums of natural history at Pavia and Milan, contain several other fragments, as I can testify.

Mr. Brocchi mentions some from the vicinity of Pavia, of Sanelombano, and even from the river Po †.

They have been found even in the higher vallies of the Alps, if we are to credit the testimony of the Marquis of St. Simon, who states in his history of the war of the Alps in 1744 ‡, that all the bones of an elephant were dug up at the foot of the lesser St. Bernard. Nor is the opposite extremity of Italy without its share.

Fortis mentions bones dug up near Montefusco, in the country anciently occupied by the Hirpini, not far from Beneventum §. There were also the supposed bones of giants found near Puzzuolo ||, and Avellino which ajoins it ¶.

Jerome Magius speaks of a skeleton five arms length long, found near Reggio, while excavating a reservoir. It is probable that it was also at Reggio that the skeleton was discovered, of which a tooth more than a foot in length was brought to Tiberius. But the passage of Phlegonus, which alludes to this occurrence, is rather equivocal, as far as regards the precise locality\*\*.

Kircher mentions a giant's tomb discovered near Cosenza in Calabria ††. The Journal of the Abbe Nazari speaks of a skeleton which was declared to be eighteen feet long, exhumed in 1665 at Tiriolo in Upper Calabria ††. It is stated, indeed, that these bones bore a decided resemblance to those of a man, but at the present day we have learned to estimate the meaning of those comparisons. The smallness of the teeth, however, which only weighed from three-quarters of an ounce to an ounce and a third, may lead us to doubt of its having belonged to an elephant.

Thomas Bartholin instances real fossil ivory found in Calabria, and near Palermo in Sicily, and bones of elephants found near Messina §§.

\* Amoretti on a Tooth and part of the Mandibola of a Mastodonte, page 5.

† Treatise on the Shells of the Apennines, vol. i. p. 181.

‡ Preface, p. 22, and in Deluc. Pass. of Hannibal, p. 171.

§ Fortis' Memoirs of the Natural History of Italy, vol. ii, p. 328.

|| Scipio Mozella's Antiquity of Puzzuoli in Fab. Colum.

¶ Fabius Columella de Glossapet, p. 34.

\*\* Phlegon. Trall. de Mirab. chap. xiv.

†† Kircher's Subterranean World, book viii, sect. ii, chap. iv.

‡‡ Academical Collection, p. 178.

§§ De Peregrin. Medic., p. 38.

Fallopian mentions some from Puzzuolo\*, and Bonani relates that in 1698 an inundation laid bare a tusk twelve palms long, in the same province†. Micheli brought away from Pouille, some pieces of ivory exhumed in 1715, near San Vetterrini‡.

To the same place may be referred the two supposed giants whose history is repeated in all the gigantologies, namely, that discovered in the fourteenth century at Trapani in Sicily, of which Boccassio speaks, and which was of course supposed to be Polyphemus§, and that found in the neighbourhood of Palermo in the sixteenth century, mentioned by Fasellus||, but the size of the former is greatly exaggerated, for they ascribe to it a length of three hundred feet; and Kircher, who visited the cavern where it was supposed to have been found, asserts in positive terms, that it was not more than thirty feet in height.

This same Fasellus points out several other places in Sicily, where bones of giants were exhumed, as for instance at Melilli, between Leontium and Syracuse, at Petralia, &c.

Mongitorei gives similar accounts¶, as does also Valguarnera\*\*, but we cannot with safety refer them all to elephants, as these writers do not furnish us with exact measurements, and we know from personal inspection, that the lairs that yield those bones in Sicily contain a quantity of those of other animals.

A circumstance, however, which makes it more than probable that a part of these pretended giants have owed their origin to the bones of elephants is this, that the latter are found, according to the testimony of the Marquis of Vintimille, the historian of Sicily, cited by Kircher††, near the sea, between Palermo and Trapani, and in the territory of the ancient Solois, which as well as Palermo was a Carthaginian colony.

Kircher, moreover, notices the accounts of two others, Sicilian giants, almost all whose bones, as is invariably the case, had been consumed, except the teeth‡‡.

Targioni quotes an ancient letter of the Chevalier Folchi, written in 1589§§, which makes mention of the tooth of a supposed giant found with petrified sharks' teeth near Syracuse|||. As for Greece, the miserable thralldom under which she groans has not afforded an opportunity of acquiring correct information on the fossils she produces; but the latter have given rise to accounts of giants, both in ancient

\* De Metallic, last chapter.

† Mus. Kircher, p. 199.

‡ Targioni Tozzetti's Travels in Tuscany, vol. viii, p. 413.

§ De Genealogia Deorum, lib iv, c. lxxviii.

|| Fasellus, Decad. i, book i, chap. iv.

¶ Mongitore on the Memorabilia of Sicily, in Brocchi's Subapennine Shells, vol. i, p. 186.

\*\* Valguarnera on the Origin and Antiquity of Panormo, in Fabius Columella, De Glosopetris, p. 34.

†† Kircher on the Subterranean World, book viii, c. iv.

‡‡ Idem. Ibid.

§§ Travels in Tuscany, vol. viii, p. 414.

||| About three years ago, they discovered in the caverns in the neighbourhood of Palermo, bones of elephants mixed with those of a species of half hippopotamus, of ruminants, bears, &c. (Laur.)

and modern times. It is not then improbable that there were bones of elephants among those alluded to.

In 1691, ~~some~~ bones were found within six leagues of Thessalonica, one of which admitted a man's arm into its cavity; a lower jaw was seven inches and a half in breadth, and weighed fifteen pounds. The other teeth weighed from two to three pounds each; but according to other accounts the heaviest did not exceed four pounds six ounces. The knee or shoulder bone was two feet eight inches in circumference. There is a minute description of them in the form of an affidavit, bearing the signatures of several witnesses, in a dissertation of an Abbe Commieus inserted in the Mercury of 1692, and quoted by the Abbé d'Artigny, in his Memoirs of History, Criticism, and Literature, vol. i, p. 136. Don Calmet was mistaken when he fixed the period of this event in 1701\*.

Suidas speaks of the bones of giants found in large quantities beneath the church of St. Mena at Constantinople, which the Emperor Anastasius caused to be deposited in his palace †.

Our journals have very recently announced a similar discovery to have been made at Demotica ‡, near Adrianople, a place rendered famous by its having been the prison of Charles XII, and which is situated at a short distance from the Mariza, the Hebrus of the ancients.

Fortis mentions a molar tooth, most unquestionably that of an elephant, found in the isle of Cerigo, and deposited in the museum of Morosini at Venice §.

It is more than probable, too, that to the elephant remains we are to refer, if not the giant forty-six arms long, mentioned by Pliny ||, which was thrown up in an earthquake at Crete, and which some fancied was Orion, and others Otus, at least the supposed body of Orestes, seven arms or twelve feet three inches in length, discovered at Tegea by the Spartans ¶, as well as that of Astericus, the son of Ajax, found in the isle of Lade, opposite Miletum, and which according to Pausanius, was seven arms in length, and that of Ajax, son of Telamon, which the same author tells us was at Salaminum, the knee ball of which equalled in size the quoits used at the Olympic games \*\*; and lastly, the great bones of Rhodes, mentioned by Phlegonus of Tralles ††.

Spain has its legends of the discovery of the bones of giants. Such is the pretended tooth of St. Christopher, shown to Louis Vivés, in the church of that name at Valentia, which he tells us was of the thickness of his fist ‡‡.

But a more positive conclusion may be drawn from the fact, that

\* Dictionary of the Bible, ii, 160.

† Suidus, voce *μηνῦς*.

‡ Journal de Paris, June 9, 1806.

§ Fortis, Ibidem.

|| Pliny, book xvi, chap. xvi.

¶ Asilus Gillius, book xvi, chap. x. Herodian, book i, chap. lxvii. Solin, book i, Pliny, Ibidem.

\*\* Pausanius, Attic., chap. xxxv.

†† Phlegonus, de Mirabil. chap. xvi.

‡‡ Vives on the Civitas Dei of Augustin, book xv, chap. ix.

there is at present in the Royal Museum at Madrid, ivory and bones of elephants found while digging the foundation of the bridge over the Mañanarez. This fact has been communicated to us by Mr. Proust, in a letter to the late Lametherie, inserted in the *Journal de Physique* of March, 1806. Mr. Dumeril observed in the same museum several fragments of tusks two feet long, portions of thighs, and other bones found near the bridge of Toledo.

But again, Spain is another of those countries to which the Carthaginians must have conveyed numerous elephants; let us then proceed to France, which, as every body knows, received fewer of them than any other country, during the historical ages.

In fact, whatever might have been the attention bestowed by the Gauls on the elephants that traversed the southern provinces of their country, at the period of Hannibal's passage, they were not the less terrified by those which Domitius Ænobarbus led thither against the Allobrogians and Auvergnians\*.

But what may nevertheless appear somewhat singular is, that the places where these bones were most anciently found are in the neighbourhood of the Rhone, and, consequently, in the country through which Hannibal and Domitius must have passed. Hence it would have been easy to attribute these bones to them, but they were at first better pleased with the idea of attributing them to giants.

In the reign of Charles VII., in 1456, the Rhone laid bare some of these pretended bones of giants at Vivarais, in the barony of Crussal, near the hamlet of Saint Peirat, opposite the town of Valence†. Louis XI, then dauphin, happening to reside at Valence at the time, investigated the authenticity of the fact, and part of the bones were carried to Bourges, by order of René, titular king of Naples, and hung up in the church of the Santa Cappella in that city, where they remained for a considerable period.

Jean Lemaire, in his *Illustrations of Gaul*, with the logic of his day, draws from these bones a convincing proof that the house of Tournon is descended from the Trojans‡.

John Cassanio, in his *Treatise on Giants* §, mentions a discovery made in the same place, a short time previous to the second Religious War, consequently, about the year 1564. Two peasants perceived some large bones protruding from the earth, on the side of a declivity; they carried them to the neighbouring village, where they were examined by Cassanir, who was then residing at Valence. He was also of opinion that they were the remains of giants; but the description he gives of one of the teeth is alone sufficient to prove that they were the bones of elephants. It weighed eight pounds, and was a foot long. Its thickness was much less, and it retained some roots. The masticating surface was concave, and four fingers broad; there were but two of them found, and the second was preserved in the neighbouring castle of Charmes.

\* Orosius, book v, c. xiii; and Florus, book iii, c. ii.

† Fulgosi de dict. factisque Memor. book i, c. vi.

‡ *Illustrations of Gaul*, and *Singularities of Troyes*, p. 289.

§ *Treatise on Giants*, p. 61.

It was also near the Rhone, but farther on in Dauphiné, that during the reign of Louis XIII. the far-famed Teutobochus was discovered. This skeleton has given rise to more disputes than any other of the fossil remains, and formed the subject of a long contest between Habcot and Riolan. The numberless pamphlets which it called forth are filled with acrimonious invective, but contain little that may serve to throw a light on the subject. The rivalry existing between the physicians and surgeons stimulated the combatants much more than the interests of science or the love of truth. And yet Riolan has demonstrated with considerable ability, considering that he had never seen the skeleton of an elephant, that those bones must have belonged to that animal\*.

As far as we can judge at the present day, the following is the real state of the case.

It appears that on the 11th of January, 1613, some bones were found near the castle of Chaumont, or of Langon, between the towns of Montricant and Saint Antoine, a part of which were broken by the workmen. A surgeon of Beaurepaire, named Mazurier, exhibited for money such as remained entire, at Paris and other places; and in order the more effectually to stimulate the curiosity of the public, he distributed a little brochure, in which he asserted that they had been found in a sepulchre thirty feet long, on the slab of which was written, "TEUTOBOCHUS REX." This was known to be the name of the king of the Cimbri, who contended with Marius, and hence he took the hint to add, that some fifty medals, bearing the image of that consul, with the initials of his name, had been found in the same place†. But our surgeon was charged with having procured a Jesuit of Tournon to draw up this document, who had forged the story of the sepulchre and the inscription: his pretended medals were inscribed with Gothic letters, and had nothing Roman about them. It does not appear that he ever offered anything in justification of this imposture.

With regard to the bones he exhibited, they consisted of the following pieces:—

1st. Two portions of the lower jaw; one of which weighed six pounds, and the other, which was larger, twelve pounds, with one tooth entire and three broken. Each tooth had four roots, and was as large as the foot of a young bull, *seemingly petrified*, and in colour resembled gunpowder.

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\* See the following pamphlets, which I quote in the order they were published.—A True History of the Giant Teutobochus, &c., 15 pages, by Mazurier. Gigantosteology, by N. Habcot, 1613. Discovery of the Imposture of the Human Bones, supposed to be those of a Giant, 1614, (by the same). Monomachia, or Reply of a Surgeon to the calumnious Inventions of the Gigantomachia of Riolan, 1614; (author unknown). A Discourse on the Size of the Giants, by Guillemeau, 1615. Reply to the Apologetic Discourse touching the truth of the existence of Giants, by N. Habcot. Judgment of the Shades of Heraclitus and Democritus, on the Reply of Habcot to the Discourse attributed to Guillemeau. Gigantology, or a History of the greatness of the Giants, by Riolan, 1618; (he herewith reprints his Gigantomachia, and his Imposture Discovered). Antigigantology, or a Counter-discourse on the greatness of the Giants; by Habcot, 1618. Fraternal Correction of the Life of Habcot, by Riolan, 1618.

† Gassendi—Life of Peircse, book iii., and in his Works, vol. v. page 250.



Habicot very properly remarks that the first fragment of the jaw contained two molar teeth, and the cavities for two others; but Riolan affirms that the teeth were detached.

This description is so obscure, that were it not for the other bones, we should be at a loss to know to what we should refer it.

2nd. Two *vertebræ*, one of which was three fingers in thickness, and admitted a man's fist into its medullary canal; the transverse apophyses were perforated at their bases: it was undoubtedly a cervical, and the delicacy of its form proves at once that it belonged to an elephant. The other was much larger, but had lost its apophysis.

3rd. A fragment from the middle of one side, six inches in length, four in breadth, and two in thickness.

4th. A fragment of the shoulder blade, the articulating surface of which was twelve inches long and eight broad.

5th. A shoulder joint as large as the head of a middle sized man, and the fissure of which would give admittance to the knob of an ink-stand.

6th. A thigh bone five feet long, three feet in circumference above, two at the prominences of the articulations, and one-and-a-half in the centre: it wanted the trochanters. The neck had neither the length nor the obliquity of that of a man.

7th. A tibia nearly four feet in length, and more than two in circumference at its base.

8th. An astragalus differing from that of animals, (i. e. *domestic* animals) but which had not the scaphoid, apophysis as large as that of a man.

9th. Lastly, a *calcaneum*, having at its base articulating surfaces for the scaphoid and cuboid bones, but the posterior apophysis or tuberosity of which was not as prominent as that of a man. This latter extremity most unquestionably belonged to an elephant; there is no other animal the astragalus of which so far resembles that of a man, as to be mistaken even by the most inexperienced observer\*.

Riolan states in one of his pamphlets that Dauphiné abounds in those bones. Indeed as early as 1580, Cassanio testifies that they exhibited the bones of giants, which had been exhumed several years previously, upon the hill that overlooks the hamlet of Taint†.

Another supposed giant was discovered in 1667, in a meadow near the castle of Molard, in the diocese of Vienne‡. The teeth weighed ten pounds each. M. de Jussieu has told me that a long time since he saw some bones of elephants hanging in one of the churches of Valence, and that they were looked upon as those of a giant. Sloane relates that in his time a French merchant had imported some from the same province into England.

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\* All doubts on this subject have been recently removed, by the discovery of the bones which the surgeon had given out to be those of Teutobochus, in the house in which Mazurier died, at Bourdeaux. They have been ascertained to be the bones, not of an elephant, but of a mastodonte, an animal which differs from the elephant merely in the structure of its teeth. (Laur.)

† Cassanio, de Gigantibus, p. 64.

‡ Dom. Calmet. Dict. de la Bible, ii, p. 161.

Gradually as we approach our own epoch, we find observations of this description more certain and determined. The drawing of the real jaw of an elephant has been published by M. de la Tourette, in the ninth volume of the *Savans Etrangers*, of the Academy of Sciences, page 747. It was found in 1760, near Saint Vallier, a quarter of a league from the Rhone, in a gravelly soil mixed with shells, eighty feet above the level of that river.

M. Guilliermin, mayor of Vienne, has recently sent a jaw, in a high state of preservation, to the King's Museum. It was found in a gravel bed near the town, in 1814.

M. Polonceau, an engineer of roads and bridges, has sent another from the same place.

They are found higher up on the Rhone; for as I am informed by Mr. Pictet, we may see in the museum of M. de Saussure, a tusk found near Geneva.

They are likewise to be found in Provence. M. Arnaud de Pemoisson, attorney-general at the court of Aix, is in possession of the lower jaw of an elephant, found in the neighbourhood of Riez, in the department of the lower Alps. I have the fact from himself.

Nor is the right bank of the Rhone without its share. Independently of what we have already mentioned on the authority of Jean Lamaire, and Cassanion, M. Soularie tells us of an almost perfect skeleton, discovered in the neighbourhood of Lavoute, in the department of Ardeche, in the banks of deposits, near the Rhone\*.

M. Faujas describes a tusk found by M. Lavalette, in the commune of Arbres, near Villeneuve de Berg, in the same department, at the foot of Mount Coirons, five feet below the surface of the soil, embedded in a volcanic tuff†. The proprietor of this tusk has sent a part of it to the King's Museum.

M. Cordier, inspector of mines, who has recently succeeded M. Faujas in the chair of geology at the Museum of Natural History, has favoured me with a note upon the position of this latter tusk, which he examined with attention. It was incrustated in the interior of a solid volcanic lair, which not only forms the summit of the hill of Arbres, but spreads itself in horizontal beds beneath the whole range of the Cairons, forming their chief foundation. Though in a high state of preservation elsewhere, this lair is almost entirely decomposed at Arbres, and is there reduced to a yellow clay, in which the pyroxenous particles have alone remained entire: the whole of this volcanic soil reposes upon a deep bed of compact calcareous shell, diversely inclined. It were to be wished it had been ascertained with accuracy whether these tusks were enveloped in the body of the volcanic bed itself, or merely in some of its ancient excrements‡. However, M. Cordier knows several other places where bones are enveloped in volcanic matter.

As we approach the Pyrennees, we meet with several other remains

\* *Natural Hist. of Southern France*, vol. iii, p. 98.

† *Annals of the Museum of Natural History*, vol. ii, p. 24.

‡ See the map of Coirons, published in the *Natural History of Southern France*.



